General Electric
TT&C Antenna and RF Subsystem

Technical Manual

Publication No. 55S381Z

IMPORTANT NOTICE

New information is provided behind the UPDATE tab in the back of this manual.

MP MASTER
MA29896

First Edition
November 1990

Scientific
Atlanta

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_07588

500-ME-12311

General Electric TT&C Antenna and RF Subsystem

Technical Manual

Publication No. 55S381Z

First Edition
November 1990

Scientific Atlanta

TABLE OF CONTENTS

Section/Paragraph		Page
	LIST OF ILLUSTRATIONS	ii
	LIST OF TABLES	ii
	SAFETY SUMMARY	iii
I	GENERAL INFORMATION	1-1
1-1	INTRODUCTION	1-1
1-2	CONTENTS OF THIS MANUAL	1-1
1-3	USE OF THIS MANUAL	1-1
1-4	FORMAT OF THIS MANUAL	1-1
1-5	CHANGE RECOMMENDATIONS	1-1
1-6	DESCRIPTION	1-1
1-7	SPECIFICATIONS	1-4
1-8	RELATED PUBLICATIONS	1-10
1-9	GLOSSARY OF SYMBOLS AND ABBREVIATIONS	1-10
II	PREPARATION FOR USE, RESHIPMENT AND STORAGE	2-1
2-1	INTRODUCTION	2-1
2-2	UNPACKING AND INSPECTION	2-1
2-3	INSTALLATION	2-1
2-4	PREPARATION FOR RESHIPMENT	2-1
2-5	STORAGE	2-1
III	OPERATION INSTRUCTIONS	3-1
3-1	OPERATION INSTRUCTIONS	3-1
IV	PRINCIPLES OF OPERATION	4-1
4-1	INTRODUCTION	4-1
4-2	BASIC THEORY OF OPERATION	4-1
4-3	DETAILED THEORY OF OPERATION	4-3
V	MAINTENANCE INSTRUCTIONS	5-1
5-1	GENERAL	5-1
5-2	SPECIAL TOOLS AND TEST EQUIPMENT	5-1
5-3	PERIODIC MAINTENANCE	5-2
5-4	PREVENTIVE MAINTENANCE	5-3
5-5	OPERATIONAL CHECKOUT	5-6
5-6	TROUBLESHOOTING	5-6
5-7	REPAIR	5-10
5-8	ADJUSTMENTS	5-18
VI	DRAWINGS, DIAGRAMS, AND PARTS LISTS	6-1
6-1	INTRODUCTION	6-1
6-2	PARTS LIST AND ASSEMBLY DRAWINGS	6-1
6-2	DRAWING INDEX	6-2

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Antenna and RF Subsystem Family Tree	1-2
1-2	TT&C Antenna and RF Subsystem	1-5
4-1	Antenna/RF Functional Block Diagram	4-2
4-2	Antenna Optics	4-3
4-3	Feed Array Configuration (Front View)	4-4
4-4	Five-Element Monopulse Beam Formation	4-6
4-5	Principle of Operation of the MONOSCAN® Converter	4-7
5-1	Phase Shifter Control Schematic	5-20
6-1	System Cabling Diagram (A3), 445874	6-5
6-2	RF Interconnect Schematic Diagram (A2A5), 446538	6-7
6-3	Feed Schematic, S-Band TT&C (A2A4A2), 446536	6-9
6-4	10-Meter Antenna Assembly (A2A4), 445884	6-11
6-5	10-Meter Parabolic Reflector Assembly (A2A4A1), 446120	6-15
6-6	Feed Assembly, S-Band TT&C (A2A4A2), 446535	6-19
6-7	MONOSCAN® Converter Model 251-2B (A2A4A2A4), 198409	6-29
6-8	Dipole Assemly (A2A4A2E1 to E4), 445486	6-35
6-9	Feed Horn (A2A4A2E5), 445495	6-39
6-10	Waveguide Installation (A2A6), 446537	6-45
6-11	LNA Assembly, S-Band TT&C (A2A6A5), 446539	6-59
6-12	Low-Noise Amplifier (A2A6A5A1, A2A6A5A2), 445877	6-65
6-13	Rotary Joint, Single Channel (A2A6E1, A2A6E2), 445796	6-67
6-14	S-Band Waveguide Diplexer (A2A6FL1), 445873	6-69
6-15	Cable Assembly, Coaxial, 7-inch (A2A4A2W13, A2A4A2W14, A2A4A2W17); 8-inch (A2A4A2W11, A2A4A2W12); 9-inch (A2A4A2W15); 10-inch (A2A4A2W16), 432112, 432114, 432116, (352149)	6-71
6-16	Cable Assembly, Coaxial, 7-inch (A2A6A5W17), 432610, (352146)	6-75
6-17	Cable Assembly, Coaxial, 4.5 inch (A2A6A5W15); 7-inch (A2A6A5W18); 8-inch (A2A6A5W19); 18-inch (A2A6A5W16), 433205, 433210, 433212, 433232 (421357)	6-79

LIST OF TABLES

Table	Title	Page
1-1	Subsystem Components	1-3
1-2	Antenna Assembly and RF System Specifications	1-6
1-3	Reflector Specifications	1-6
1-4	Diplexer Specifications	1-7
1-5	Bandpass Filter Specifications	1-7
1-6	LNA Characteristics	1-8
1-7	Motorized Phase Shifter Specifications	1-8
1-8	S-Band Feed Specifications	1-9
1-9	Symbols and Abbreviations	1-10
5-1	Special Tools and Test Equipment	5-1
5-2	Periodic Maintenance Chart	5-2
5-3	Consumable Materials List	5-3
5-4	Routine Inspection	5-4
5-5	Troubleshooting Chart	5-7
5-6	Recommended Torque Values	5-13
6-1	Drawing Index	6-2

SAFETY SUMMARY

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this publication. These are recommended precautions that personnel must understand and apply during many phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe all safety regulations. Do not replace components or make adjustments inside the equipment with any power sources turned on. Under certain conditions, such as charges retained by capacitors, dangerous potentials may exist when the power control is in the off position. To avoid casualties, always remove power and discharge and ground a circuit before touching it.

RESUSCITATION

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person service or adjust the equipment except in the presence of someone who is capable of rendering aid.

WEAR PROTECTIVE CLOTHING

Wear protective clothing (gloves, apron, etc.) approved for the materials and tools being used.

USE SAFETY APPROVED EQUIPMENT

When cleaners are being applied, approved explosion-proof lights, blowers, and other equipment shall be used. Insure that fire fighting equipment is readily available and in working order.

GIVE CLEANERS SPECIAL CARE

Keep cleaners in approved safety containers and in minimum quantities. Discard soiled cleaning clothes into safety cans.

WARNING

HAZARDOUS VOLTAGE

Voltages present in this equipment and associated cables are lethal. Extreme caution must be exercised during these procedures.
DEATH OR SEVERE INJURY
may result if personnel fail to observe safety precautions.

WARNING

HAZARDOUS CHEMICALS

are used in cleaning and maintenance procedures.
EXPLOSIONS, OR DAMAGE TO EYES, LUNGS, SKIN, NOSE, AND THROAT
may result if personnel fail to observe safety precautions.

Section I

GENERAL INFORMATION

1-1 INTRODUCTION.

This manual provides operation and maintenance instructions for the S-band Tracking, Telemetry and Command Antenna RF subsystem equipment.

1-2 CONTENTS OF THIS MANUAL.

This manual consists of the following sections:

Section I GENERAL INFORMATION
Section II PREPARATION FOR USE, RESHIPMENT, AND STORAGE
Section III OPERATION INSTRUCTIONS
Section IV PRINCIPLES OF OPERATION
Section V MAINTENANCE INSTRUCTIONS
Section VI DRAWINGS, DIAGRAMS, AND PARTS LISTS

1-3 USE OF THIS MANUAL.

A table of contents indicates sections, paragraphs, titles, and page numbers to locate information. Illustrations, tables, and diagrams supplement the text material. Lists of illustrations and tables indicate the numbers, titles and page numbers. Abbreviations, phrases, and words appear in the text exactly as they appear on the equipment.

1-4 FORMAT OF THIS MANUAL.

Paragraph headings of this manual are formatted to indicate subordination of subject matter as follows:

1-1 PRIMARY HEADING.
1-1.1 First Subordinate.
1-1.1.1 Second Subordinate.
1-1.1.1.1 Third Subordinate.
1-1.1.1.1.1 Fourth Subordinate.

1-5 CHANGE RECOMMENDATIONS.

Any manual can be improved. The major source of feedback is the user. Submit recommendations concerning changes to Scientific-Atlanta.

1-6 DESCRIPTION.

The 10-meter antenna subsystem provides simultaneous transmit and receive capability at S-band frequencies. The antenna subsystem receives and autotracks RHC polarized signals from a satellite operating at 2211 MHz and is capable of transmitting RHC polarized signals with an input power level of 3000 W CW (continuous wave) at a frequency of 2036 MHz. Figure 1-1 is the family tree block diagram. Table 1-1 is a list of subsystem components.

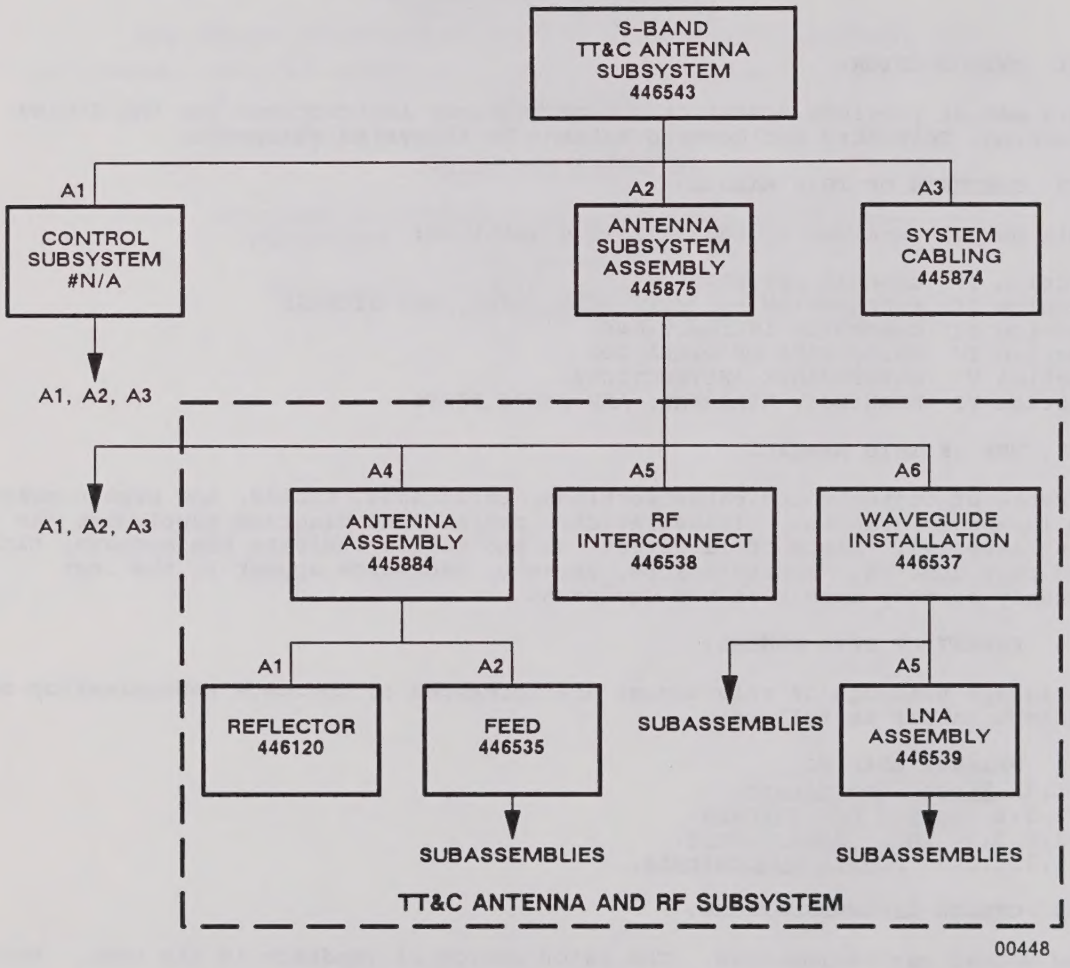


Figure 1-1. Antenna and RF Subsystem Family Tree

Table 1-1. Subsystem Components

Ref. Des.	Assembly	Part No.
A2	Antenna System Assembly (Refer to system manual)	445875
A2A4	10-Meter Antenna Assembly	445884
A2A4A1	10-Meter Parabolic Reflector Assembly	446120
A2A4A2	Feed Assembly	446535
A2A4A2A1	Hybrid Polarizer	445011
A2A4A2A2/A3	Difference Channel Comparators	444992
A2A4A2A4	MONOSCAN® Converter	198409
A2A4A2E1/E2/E3/E4	Dipole Assemblies	445486
A2A4A2E5	Feed Horn	445495
A2A4A2FL1/FL2/FL3	Coaxial Filters	444699
A2A4A2W11 through W17	Coaxial Cable	See Section VI
A2A4A2Z1	Phase Shifter	444991
A2A5	RF Interconnect Diagram (Ref)	446538
A2A6	Waveguide Installation	446537
A2A6A5	LNA Assembly	446539
A2A6A5A1/A2	Low-Noise Amplifiers	445877
A2A6A5DC4	Directional Coupler	445027
A2A6A5S1	Waveguide Switch	444737
A2A6A5W15 through W19	Coaxial Cables	See Section VI
A2A6DC1/DC2/DC3	Couplers	See Section VI
A2A6E1/E2	Rotary Joints	445796
A2A6FL1	Diplexer	445873

MONOSCAN® is a registered trademark of Scientific-Atlanta, Inc.

The antenna subsystem, shown in Figure 1-2, consists of a 10-meter-diameter parabolic reflector, a prime-focus S-band feed, a redundant low-noise amplifier assembly, and a waveguide subsystem.

Refer to Section IV for a functional block diagram and to Section VI for applicable drawings supporting the following descriptive paragraphs.

1-6.1 Reflector. The reflector is a 10-meter-diameter paraboloid shape with a focal-length-over-diameter ratio of 0.39. The reflector consists of a machined, reinforced circular hub which supports 24 radial truss ribs and other intercostal braces. The 24 trusses support 24 solid-surface reflector surface panels. The entire reflector is assembled by bolting these components together. Each panel is supported by machined tabs on the radial trusses which lock the overall shape and antenna surface tolerance.

1-6.2 Spars. The feed assembly is held in place by four aluminum spars with a rectangular cross-section structure designed to minimize signal blockage while providing necessary support and stiffness.

1-6.3 S-Band Tracking Feed Assembly. The S-band feed assembly contains a four-element array of crossed dipoles, a central waveguide horn and polarizer, a monopulse comparator network including 90-degree hybrids, a MONOSCAN® Converter, bandpass filters, and motorized phase shifter. Autotracking capability is achieved using a single-channel pseudo-monopulse technique. The feed assembly is mounted at the reflector's focal point. The feed provides a waveguide sum channel output and a coaxial difference channel output.

1-6.4 Low-Noise Amplifier Assembly. The low-noise amplifier (LNA) assembly consists of a pair of GaAs FET amplifiers mounted to a waveguide transfer switch. The switch routes the receive signal from the feed to either of the LNAs and connects the other LNA to a test port consisting of a coax-to-waveguide adapter and a coaxial directional coupler.

1-6.5 Waveguide Subsystem. The waveguide subsystem separates and routes the transmit band and receive band signals, and combines the sum and difference channel signals, and provides test couplers for sampling and injecting signals. The subsystem includes a transmit-receive frequency diplexer, rotary joints, waveguide transmission lines, and directional couplers.

1-7 SPECIFICATIONS.

Tables 1-2 through 1-8 contain pertinent characteristics and specifications.

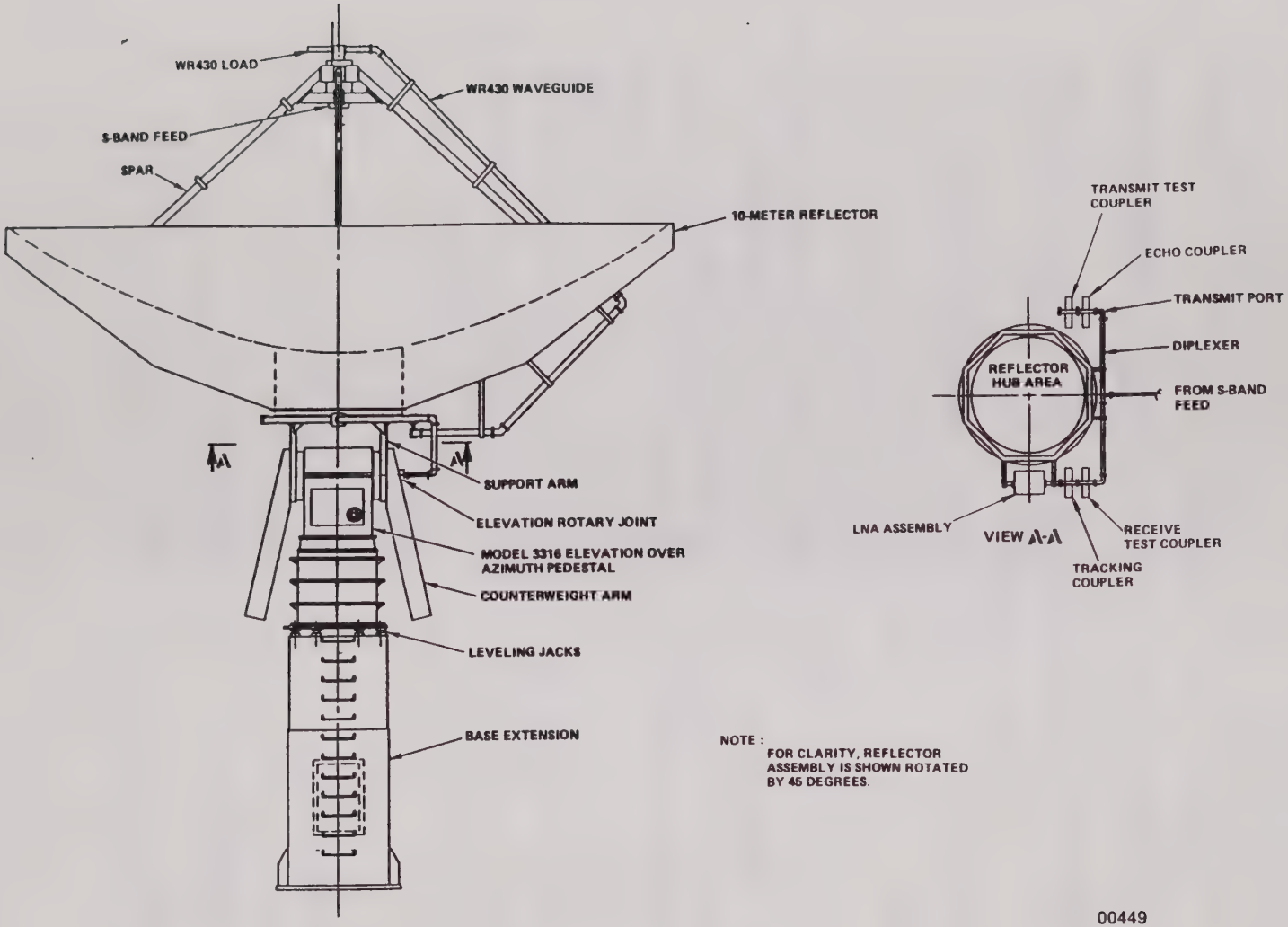


Figure 1-2. TT&C Antenna and RF Subsystem

Table 1-2. Antenna Assembly and RF System Specifications

Characteristic	Specification
Capabilities	Transmission, single-channel monopulse reception
Antenna Configuration	10-meter parabolic reflector; prime-focus S-band feed assembly; quadripod mount
Feed Configuration	Transmit: square horn Receive: square sum channel horn with diamond array of difference channel crossed dipoles
Frequency of Operation	Transmit: 2035.9625 MHz ± 1.5 MHz Receive: 2211 MHz ± 1.5 MHz
Polarization	Right-hand circular
Gain	Transmit: 41.7 dBi at base extension interface Receive: 44.8 dBi, nominal at feed output
G/T (clear sky)	18.5 dB/K, Min at 5° elevation
Axial Ratio	2.0 dB Max, 1.0 dB typical
RF Power Handling (Transmit)	3000 watts, CW

Table 1-3. Reflector Specifications

Characteristic	Specification
Diameter	10-Meter (396 in)
f/D	0.39
Surface Tolerance	0.040 in rms static
Focal Length	154.4 in
Survival Wind Velocities (Safely Supported)	125 mi/h, no ice 87 mi/h with 2 in radial ice
Shipping Data	1450 cu ft, 9700 lb

Table 1-4. Diplexer Specifications

Characteristic	Specification
Frequencies	Transmit: 2030 - 2115 MHz Receive: 2205 - 2295 MHz
Insertion Loss	Transmit: 0.3 dB, Max Receive: 0.4 dB, Max
Isolation	Transmit/Receive: 110 dB, Min Receive/Transmit: 110 dB, Min
VSWR	Transmit: 1.2:1, Max Receive: 1.25:1, Max
Power Handling (Transmit)	3000 watts, CW

Table 1-5. Bandpass Filter Specifications

Characteristic	Specification
Frequency Band of Operation	2200 - 2400 MHz
Insertion Loss	<0.5 dB
VSWR	<1.5:1
Out-of-Band Rejection	>40 dB across 2025 to 2120 MHz

Table 1-6. LNA Characteristics

Characteristic	Specification
Frequency Band	2205 - 2295 MHz
Noise Temperature	80K, Max
Gain	50 dB, Min
Gain Flatness	±0.5 dB/100 MHz
Gain Stability	Vs. Time: < ±0.5 dB/8 hr < ±0.1 dB/1 min
One dB Compression Point	+5 dBm, Min
Third Order Intercept Point	+15 dBm, Min
VSWR	Input: 1.25:1, Max Output: 1.50:1, Max

Table 1-7. Motorized Phase Shifter Specifications

Characteristic	Specification
Frequency Band	DC -4.0 GHz
Phase Adjustment	150°/GHz 330° at 2.2 GHz
VSWR	1.3:1 Max to 2 GHz 1.5:1 Max to 4 GHz
Insertion Loss	0.5 dB Max to 2 GHz 0.75 dB Max to 4 GHz
RF Power Handling	100W avg, 5 kW peak
DC Voltage	28V dc
Full Range Travel Time	Variable, 2.5 - 4.0 minutes
Follower Potentiometer	10K ohm

Table 1-8. S-Band Feed Specifications

Characteristic	Specification
Frequency Band of Operation	Transmit: 2025 - 2120 MHz Receive: 2205 - 2295 MHz
Type	Prime focus
Radome	Fiberglass
Polarization	Right-hand circular (RHC)
Channels	
Output	Sum (Σ) Difference (Δ)
Input	Transmit (Σ)
Autotrack Capability	Single-channel pseudo-monopulse technique
RF Interfaces	
Sum Channel	WR430 flange (CPRG)
Difference Channel	N-female connector
Power Interface	MS3112E-22-41P
Pressure	2.0 psig, Max

1-8 RELATED PUBLICATIONS.

The following related publications, of the issue and date in effect at the time of publication of this manual, are applicable. Equipment descriptions, maintenance, operation, and parts listings are contained in the individual equipment publications.

Publication Number	Publication Title
55S380Z	System, Operation and Maintenance Manual
55E170Z	Operation and Maintenance Manual Model 3723 Local Control Unit
55P101Z/0204	Operation and Maintenance Instructions with Parts List, Model 3311/0204 Tracking Pedestal
55E169Z	Operation and Maintenance Instructions with Parts Lists, Model 3842 Autotrack Controller
55E175Z	Operation and Maintenance Instructions with Parts List, Model 3673 SCR Power Amplifier
55E169Z/0204/ACU	Supplement to Model 3842 Autotrack Controller for Model 3842/0204/ACU Antenna Control Unit
55E169Z/0204/ALCU	Supplement to Model 3842 Autotrack Controller for Model 3842/0204/ALCU Antenna Local Control Unit

1-9 GLOSSARY OF SYMBOLS AND ABBREVIATIONS.

Table 1-9 contains a listing that defines all nonstandard symbols and abbreviations used in this manual.

Table 1-9. Symbols and Abbreviations

Symbol or Abbreviation	Definition
ACU	Antenna Control Unit
AGC	Automatic Gain Control
ALCU	Antenna Local Control Unit
AZ	Azimuth
CFE	Customer-furnished Equipment
CMD	Command
CW	Continuous Wave
EL	Elevation
G/T	Gain-to-Noise Temperature
HMD	Hardware Maintenance Depot
IF	Intermediate Frequency
IFL	Intra-facility Link
IND	Indicator
LNA	Low-noise Amplifier
LRU	Line Replaceable Unit
MTTR	Mean-Time-to-Repair
PED	Pedestal
R/R	Remove and Replace
RCP	Receiver Control Processor
RF	Radio Frequency
RHC	Right-hand Circular
RX	Receive or Receiver
SCR	Silicon-controlled Rectifier
STAS	S-band TT&C Antenna Subsystem
TT&C	Tracking, Telemetry and Command
TX	Transmit or Transmitter

Section II

PREPARATION FOR USE, RESHIPMENT AND STORAGE

2-1 INTRODUCTION.

This section provides provisions for installing the equipment and for reshipment and storage as required.

2-2 UNPACKING AND INSPECTION.

While unpacking, carefully compare bill of lading with equipment, checking for damage that may have occurred during transit.

2-3 INSTALLATION.

Installation of units has been minimized by shipping assemblies ready for operation. Thus, installation is mainly accomplished by interconnecting operational units. Unit installation is covered in the appropriate unit maintenance manual.

2-3.1 Equipment Connections. Refer to system cabling diagram in Section VI for system-level cabling. All control and RF signal cables terminate in connectors. Power cables connect by inserting bare wire into screw terminals.

2-3.2 Initial Checkout. Detailed minimum performance standards appear in the On-Site Acceptance Test Procedure, Drawing ATP446458. This procedure will be performed at installation and prior to initial operation.

2-4 PREPARATION FOR RESHIPMENT.

The following procedures provide instructions for reshipment of a unit:

a. Tag or identify defective equipment and note defect and circumstances, if any.

b. Notify Scientific-Atlanta Customer Service Department of circumstances and request shipping instructions. Reference sales order, purchase order, and date equipment was received.

c. Reship unit in original shipping container or use a strong shipping container to protect unit during shipment.

d. Package unit using shock-absorbing material around all sides of equipment, especially front panel.

e. Seal container securely and mark outside of container FRAGILE.

2-5 STORAGE.

During storage, protect equipment from temperature extremes which cause condensation within the equipment.

Section III

OPERATION INSTRUCTIONS

3-1 OPERATION INSTRUCTIONS.

Operation of the RF equipment is a system-level task, therefore, instructions for the operation of the RF equipment is contained in the system manual, 55S380Z.

Section IV

PRINCIPLES OF OPERATION

4-1 INTRODUCTION.

This section provides a subsystem level theory of operation for the S-band TT&C Antenna and RF equipment. This discussion is divided into two segments; the basic theory of operation, and the detailed theory of operation. The basic theory provides the user with a brief functional overview of the entire antenna and RF system and is accompanied by a high-level system block diagram. The detailed theory is a more in-depth discussion based on individual equipments and particular operational functions (i.e., reflector, feeds, waveguide, LNA, and pressurization).

4-2 BASIC THEORY OF OPERATION.

Refer to Figure 4-1, an overall block diagram of the antenna feed and electronics, for the following discussion.

The antenna system simultaneously transmits and receives RHC polarized signals at 2036 MHz and 2211 MHz, respectively. The reflector concentrates signals received from a satellite into the prime-focus mounted feed. The antenna has a highly directive receive pattern with a half-power beamwidth of 0.90 degrees. The nominal antenna gain at the feed waveguide output is 44.8 dBi.

The reflector also produces a highly directional transmit pattern with a half-power beamwidth of 0.95 degrees and a gain, measured at the transmit interface at the system base of 41.7 dBi, minimum. The antenna accepts transmit input signals up to 3000 watts, CW.

In addition to receiving data, the S-band feed also produces a tracking error signal which is used to position the antenna and track the satellite through its orbit. A four-element array of crossed dipoles surrounding the central horn provides the tracking information.

The S-band feed subsystem consists of a central square waveguide horn and an array of four crossed dipoles. The central horn utilizes a slope-septum polarizer to separate the RHC and LHC polarization components. The LHC feed port is terminated with a waveguide load and the RHC port is routed out of the feed to the waveguide subsystem.

The four crossed-dipole elements form four offset RF beams. Two of the beams are formed in the elevation plane and two in the azimuth plane. The offset beams provide output signals proportional to the targets angular offset from the antenna's boresight axis; these signals are used to automatically track the target.

The outputs of the two dipole elements that form the elevation beams are routed to a combination monopulse comparator and polarization combiner where an RHC polarized signal equal to the vectorial difference between the input beams is generated. An identical circuit generates the azimuth difference signal. The two difference signals are then routed through bandpass filters to a MONOSCAN® Converter.

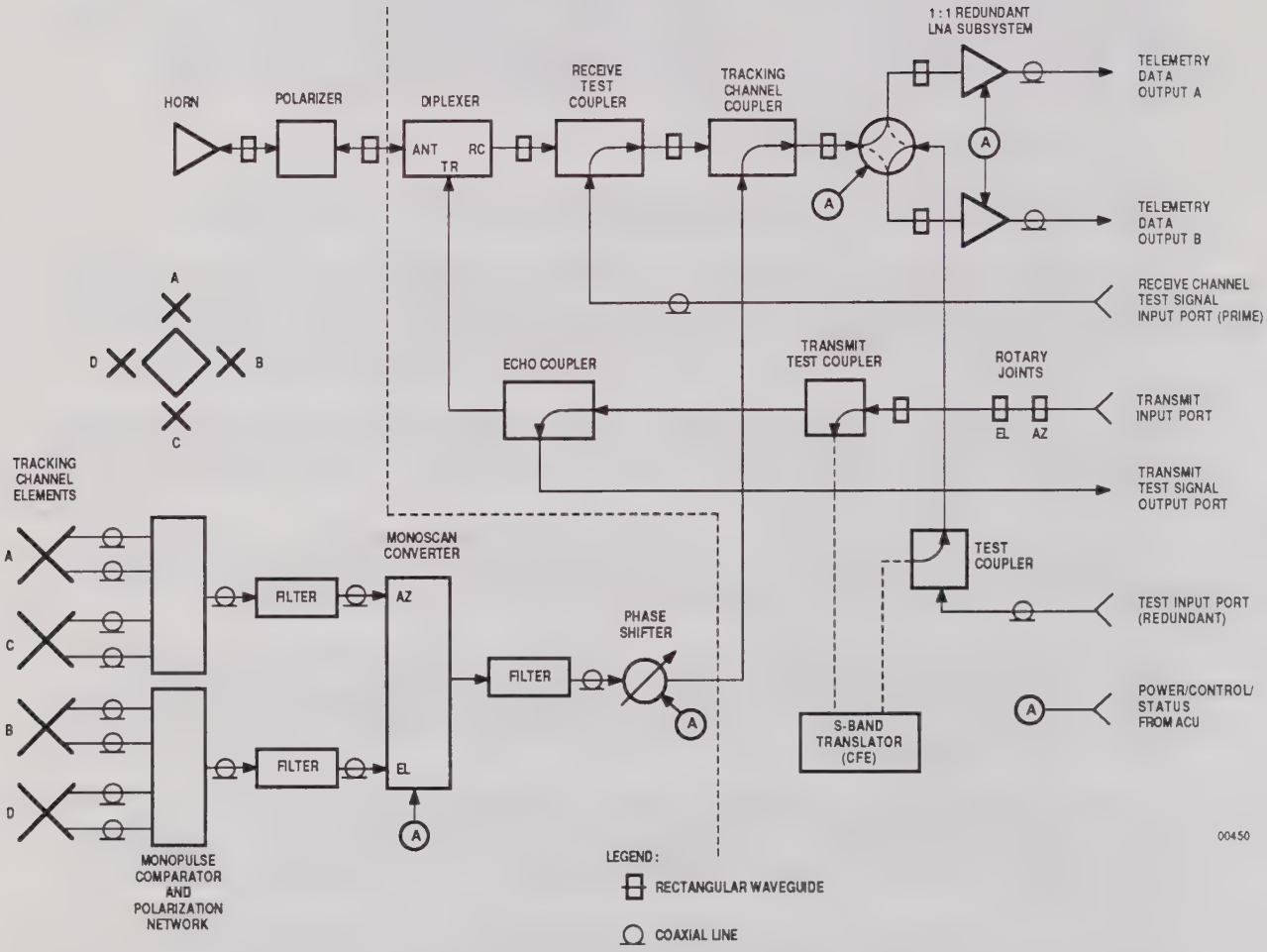


Figure 4-1. Antenna/RF Functional Block Diagram

The MONOSCAN® Converter utilizes control and timing signals from the Antenna Control Unit to produce a single output difference signal consisting of the azimuth and elevation difference signals multiplexed in time. This composite tracking signal is filtered by another bandpass filter and routed through the motorized phase shifter to the feed output.

The waveguide subsystem routes transmit signals from the transmit input port in the pedestal base extension to the diplexer transmit port, receive signals from the diplexer receive port to the LNA subsystem input, and both transmit and receive signals between the diplexer and the feed waveguide port.

The transmit waveguide path includes rotary joints in both azimuth and elevation axes of the pedestal, and a pair of 30 dB directional couplers used to sample the transmit signal for various test purposes. The receive waveguide path includes a 40 dB coupler used to inject test signals into the receive path and a 10 dB coupler used to combine the composite tracking signal with the sum channel signal to form a single-channel monopulse tracking signal. The waveguide subsystem components are primarily mounted to the antenna reflector back structure.

The LNA subsystem consists of two low-noise amplifiers in a redundant configuration, a waveguide transfer switch to route the receive signal to the desired LNA, and a coaxial test coupler and a coax-to-waveguide adapter for injecting test signals into the standby LNA. The LNA subsystem is mounted in an enclosure on the pedestal counterweight arms.

The various test and data signals are routed from the couplers and LNA subsystem to the pedestal base extension via low-loss coaxial cable.

4-3 DETAILED THEORY OF OPERATION.

4-3.1 Antenna Reflector. The reflector is a 10-meter-diameter paraboloid structure with a focal-length-over-diameter ratio of 0.39. The focal length of the reflector is 154.4 inches. The antenna optics are shown in Figure 4-2.

4-3.2 S-Band Tracking Feed Assembly. The following paragraphs provide a detailed description of the S-band transmit and receive feed and the associated feed RF electronics.

4-3.2.1 S-Band Tracking Feed. The S-band feed consists of a four-element dipole array arranged in a diamond configuration around the sum channel feed horn (Figure 4-3). The central sum channel horn is located for best attainable illumination of the reflector and provides high gain for data reception. The four tracking dipole elements are combined to produce signals which are skewed off-axis. The skewed signals provide the required azimuth and elevation error signals when the satellite is not directly on the boresight axis of the sum channel beam. These signals are used to automatically track the target.

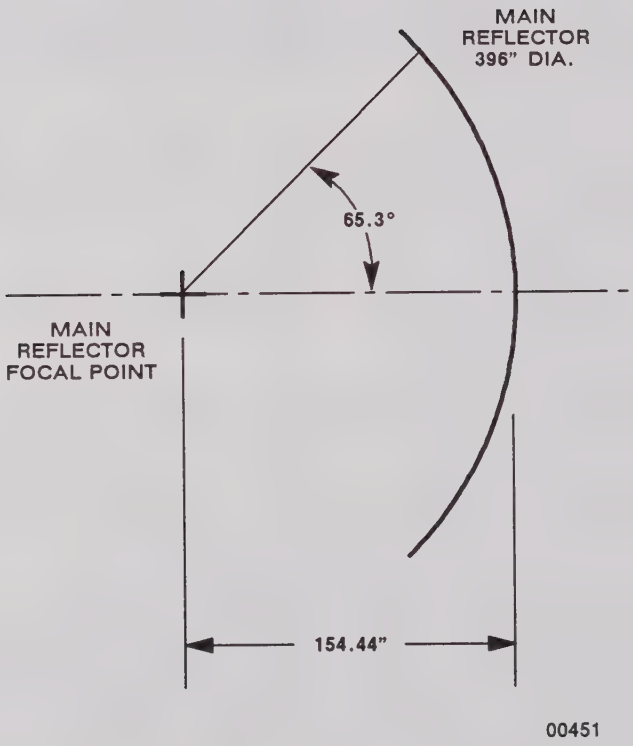


Figure 4-2. Antenna Optics

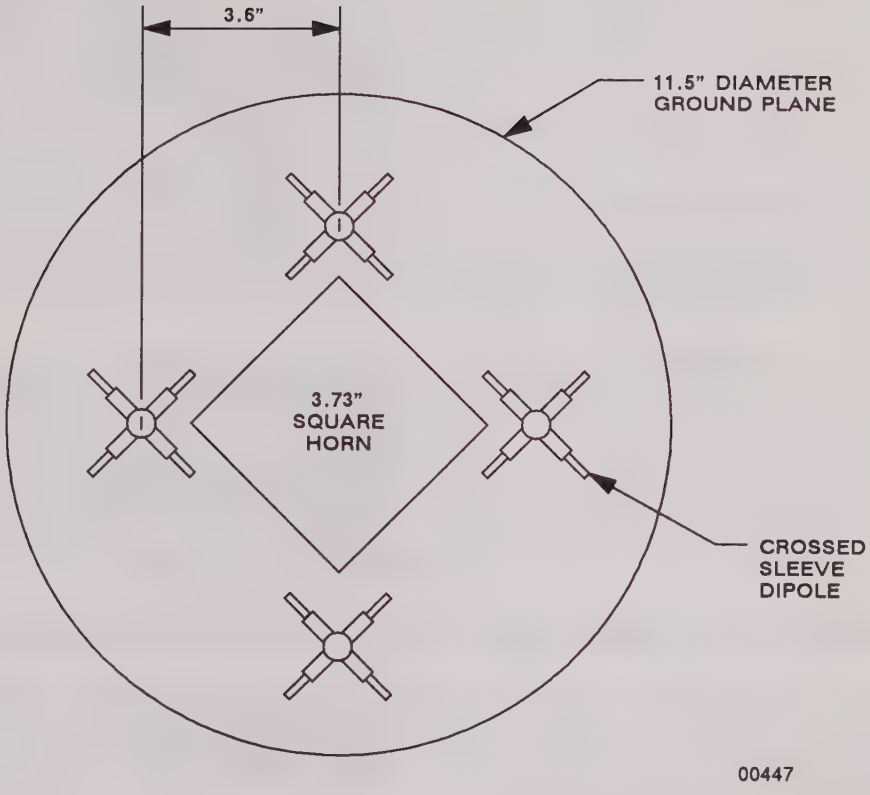


Figure 4-3. Feed Array Configuration (Front View)

4-3.2.2 S-Band Sum Channel RF Signal Processing. The central square waveguide feed horn operates over the receive and transmit frequency bands. The feed output is connected to a slope-septum polarizer to provide the required RHC polarization. The polarizer output is connected to the waveguide diplexer which separates the receive and transmit bands. The receive band diplexer output is fed to the LNA subsystem.

4-3.2.2.1 Slope-Septum Polarizer. The slope-septum polarizer is a two-mode waveguide device that combines the polarizer and orthomode transducer (OMT) functions in one component. The polarizer consists of a square waveguide with an E-plane sloped septum. The orthomode transducer separates two orthogonal polarizations: right-hand circular and left-hand circular. The polarizer is a cast-aluminum device which uses no dielectrics, yet provides high temperature stability and very low insertion loss. The RHC output of the slope-septum polarizer is routed to the waveguide subsystem. The LHC output is terminated with a WR430 waveguide load.

4-3.2.3 S-Band Tracking Signal Generation. Each of the four difference dipoles has two orthogonal linear outputs. The eight outputs of the four difference dipoles are connected into two coaxial combination monopulse comparator and polarization combiner networks which provide RHC polarized azimuth and elevation difference signals. Coaxial bandpass filters eliminate out-of-band signals. The azimuth and elevation signals are connected into a stripline MONOSCAN® Converter for time duplexing. The composite difference signal is filtered by another bandpass filter and connected to a motorized phase shifter before exiting the feed.

4-3.2.3.1 Monopulse Comparator and Polarization Combiner. Refer to Figure 4-4. The monopulse comparator and polarization combiner allows combining of the four tracking dipole signals to obtain the RHC difference signals for receiving tracking information. The circuit derives the difference between each of the skewed signals formed by the opposed tracking elements. The azimuth difference signal (Δ AZ) is the signal from the element 2 minus the signal from the opposing element 4. The elevation difference signal (Δ EL) is signal 1 minus the opposing signal 3. This process is repeated for horizontal and vertical polarization signals.

Ninety-degree hybrids internal to the unit combine the vertical and horizontal linear polarized difference signals to produce RHC polarized outputs.

After processing, the difference signal outputs are used for automatically tracking the target. Each difference signal generates two beams, one in azimuth and one in elevation, with a null on the boresight axis. This arrangement provides the autotrack system target direction information relative to the boresight axis.

4-3.2.3.2 Bandpass Filters. Bandpass filters in the tracking channel path inputs and outputs of the MONOSCAN® Converter remove out-of-band signals which may damage the MONOSCAN® Converter or interfere with data reception. Each filter provides at least 40 dB of transmit band rejection while passing signals between 2200 and 2400 MHz. Two filters, combined with 25 dB minimum isolation between the central horn and dipoles, and 10 dB coupling between the difference and sum channels, provide more than 115 dB isolation of transmit signals from the LNA subsystem. Refer to Table 1-4 for performance specifications.

4-3.2.3.3 S-Band MONOSCAN® Converter. Refer to Figure 4-5 for the following discussion. The S-band MONOSCAN® Converter utilizes pin diode switches and a 180-degree phase shifter to provide a single RF output time-shared by the azimuth and elevation difference signals. Each error signal can be selected with a 0-degree or 180-degree phase shift. The required four states, as shown in Figure 4-5, can be supplied by setting the required voltage/current into each diode. States 1 and 2 are dedicated for the azimuth 0-degree and 180-degree positions and states 3 and 4 for the elevation 0-degree and 180-degree positions. The scan signals needed to drive the MONOSCAN® Converter are generated by the Model 3842 Autotrack Controller.

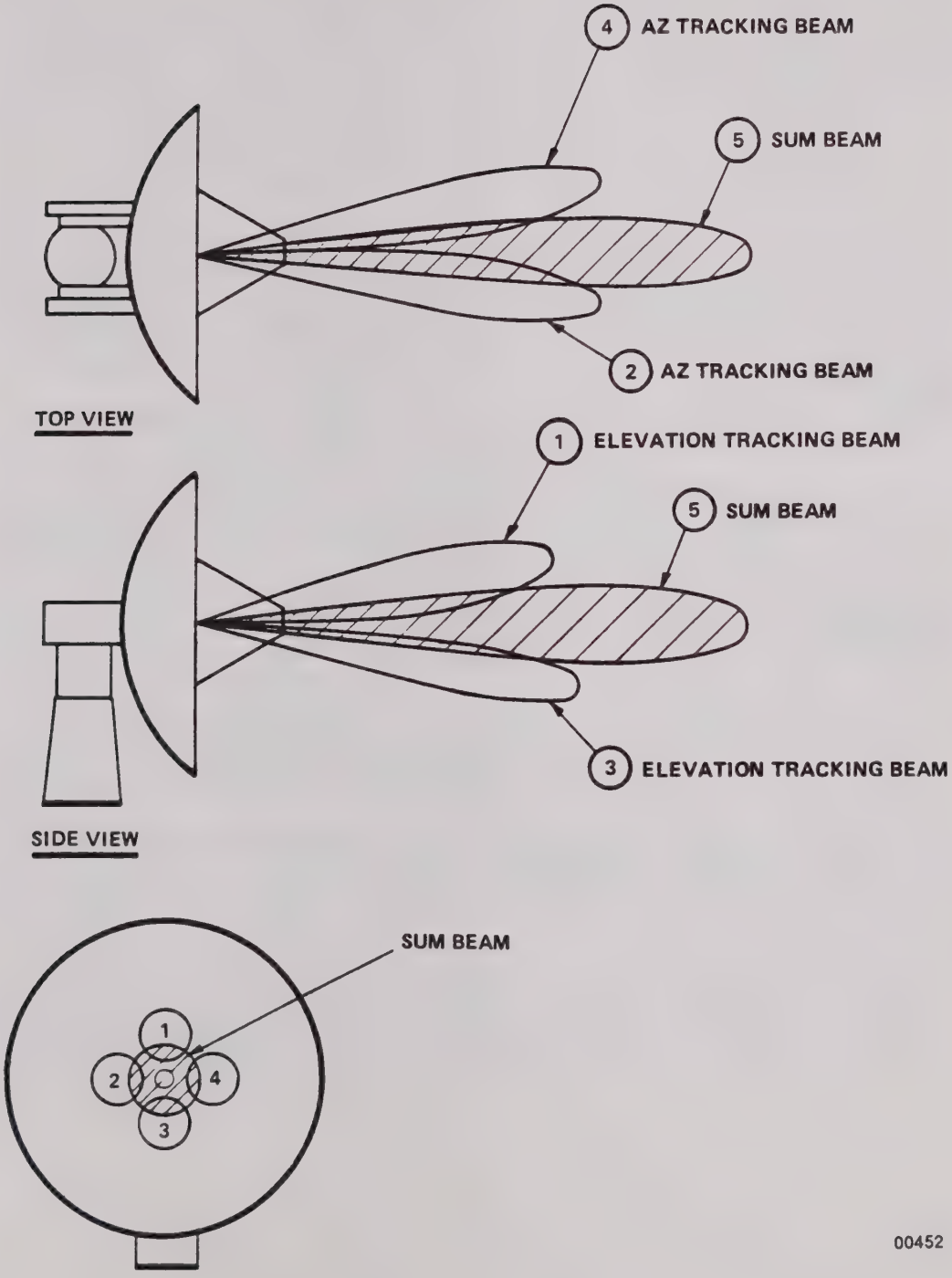


Figure 4-4. Five-Element Monopulse Feed Beam Formation

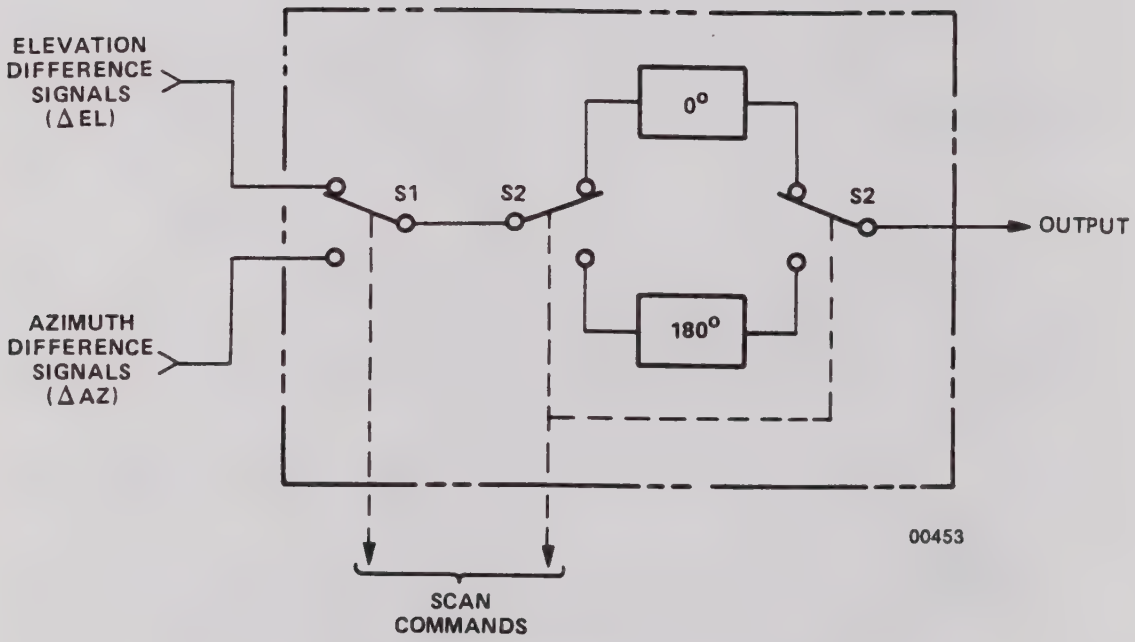


Figure 4-5. Principle of Operation of the MONOSCAN® Converter

4-3.2.3.4 Motorized Phase Shifter. The motorized phase shifter allows the phase length of the difference channel tracking signal to be remotely adjusted. Optimum tracking performance requires that the sum and difference channel signals be in-phase at the receive frequency. The motorized phase shifter utilizes an adjustable length coaxial line to vary the electrical length over a 330-degree range. The phase shifter is factory set for optimum tracking at 2211 MHz and should only be adjusted if the receive frequency is changed or if a component in either the sum or difference channel paths prior to the 10 dB directional coupler used to combine the signals is repaired or replaced. Performance characteristics are summarized in Table 1-7.

4-3.3 Waveguide Subsystem. The following paragraphs provide a detailed description of the microwave subsystem. Refer to Figure 4-1.

4-3.3.1 Diplexer. The RHC polarized port of the feed is connected via WR430 waveguide to the common port of the waveguide diplexer. The diplexer is a three-port device with one port common to both transmit and receive band frequencies. The other two ports are for the receive and transmit channels, respectively. The diplexer provides isolation of at least 110 dB between the transmit and receive frequencies. Refer to Table 1-4 for additional specifications.

4-3.3.2 Receive Test Coupler. The receive port of the diplexer is connected to a 40 dB crossguide coupler. The purpose of this coupler is to allow test signals to be injected into the receive path.

4-3.3.3 Tracking Channel Coupler. The tracking channel coupler is a 10 dB broadwall coupler that combines the difference channel signal with the sum channel receive signal. The phase length of the signal paths are adjusted using the motorized phase shifter such that the signals combine in-phase. Since the MONOSCAN® Converter applies a 0°/180° phase shift to the difference channel signal, the net result is the sum channel signal amplitude modulated with the difference channel signal to produce a composite single-channel monopulse tracking signal. The composite signal is routed to the LNA subsystem via WR430 waveguide.

4-3.3.4 Transmit Signal Path. The S-band transmit signal is generated by other equipment and applied to the antenna system at the transmit input port located in the pedestal base extension. This signal is routed via a WR430 waveguide run with azimuth and elevation rotary joints to the diplexer.

4-3.3.4.1 Transmit Waveguide. The S-band transmit signal at 2036 MHz is routed through the pedestal via WR430 rectangular waveguide. Rotary joints in the azimuth and elevation axes provide the required pedestal travels. The waveguide run is designed to handle 3 kW CW power. CPRG flanges are used for all waveguide junctions.

4-3.3.4.2 Transmit Test and Echo Couplers. A dual-arm crossguide coupler at the output of the elevation rotary joint provides two 30 dB sample ports. The first arm is the transmit test coupler and the coupled signal is routed via coaxial cable to the CFE test translator located in the pedestal base extension. The second arm is the echo coupler and its signal output is routed to the IFL interface in the base extension.

4-3.4 LNA Subsystem. Refer to Figure 4-1. The LNA subsystem is a one-for-one redundant LNA assembly which includes a coaxial test input for testing the off-line LNA. Receive signals from the tracking channel coupler are routed via a waveguide switch to one of the two LNAs. The other LNA is connected to a coaxial input where test signals can be injected. The LNA subsystem is mounted in an enclosure on the pedestal counterweight arm.

4-3.4.1 Waveguide Switch. The waveguide switch is a four-port WR430 transfer switch. The switch utilizes an "Autosafe" circuit to provide failsafe operation without a constant holding current. The switch circuitry uses a charged capacitor to hold the switch in the energized position. Short circuiting the switch contacts discharges the capacitor and returns the switch to the failsafe, de-energized position. A built-in set of contacts provides an indicator of switch position that is displayed on the Model 3842 ACU front panel.

4-3.4.2 Low-Noise Amplifiers. The LNAs are GaAs FET amplifiers which provide a minimum gain of 50 dB with a typical noise temperature of 80 K. The LNAs have a WR430 waveguide input and a type-N coaxial output. Alarm circuitry monitors the current of the entire amplifier. If a problem should occur, an indicator light alerts the operator at the ACU. The amplified data signals are routed to the IFL interface in the pedestal base extension.

4-3.4.3 Test Coupler. A coax-to-waveguide adapter mounted to the waveguide switch enables a test signal to be injected directly into the LNA which is not connected to the antenna. A 20 dB coaxial coupler connected to the coax adapter allows a test signal from the CFE test translator to be injected at the same time as the primary test signal.

4-3.5 Pressurization System. The feed enclosures and feed waveguide components are pressurized up to 2.0 psig with dry air provided by a CFE pressurizer/drier unit. The pressurization system consists of the CFE dehydrator unit and the associated dry air distribution piping. The distribution system supplies this dry, pressurized air through 3/8-inch rubber hose to all components requiring pressurization. The feed is equipped with 2.0 psig relief valves to prevent over-pressure conditions due to failure of the compressor regulator. This pressure relief valve is also equipped with a manual release to allow each of the pressurized components to be purged with dry air.

The pressurization unit pump should be off for five minutes for every minute it is on. There are small leaks always present which are difficult to avoid; however, larger leaks should be repaired when they place a strain on the pressurizer. Further details concerning the operation of the pressurization system can be located in the appropriate vendor manual.

Section V

MAINTENANCE INSTRUCTIONS

5-1 GENERAL.

This section provides instructions and information pertaining to subsystem-level preventive and corrective maintenance. For maintenance procedures on specific units used within the system, refer to the applicable manuals for the specified unit.

5-2 SPECIAL TOOLS AND TEST EQUIPMENT.

Table 5-1 lists special tools and test equipment recommended for checkout, alignment, and maintenance tasks. Equivalent equipment may be substituted.

Table 5-1. Special Tools and Test Equipment

Item	Description	Supplier/Model
Sweep Oscillator	2.0 - 2.3 GHz CW	HP8350B/w HP83522A and Option 002 or HP8660C
Spectrum Analyzer	2.0 - 2.3 GHz	HP8560A RF, or HP141T Mainframe; 8554B Plug-in; 855A Plug-in; 8552B IF Plug-in
Power Meter	50 dB Power Range 2.2 - 2.3 GHz Range	HP436A; HP8481A Power Sensor, 8484A Power Sensor
Frequency Counter	2.2 - 2.3 GHz Range	HP5343A
Signal Generator or Sweep Oscillator	2.2 - 2.3 GHz Range	
Connector Adapter	SMA-N, BNC, etc.	NA
Attenuator	3 dB, 6 dB, 10 dB, 20 dB	NA
Coax-to-waveguide Adapter	WR430	NA
Lift Truck with Bucket	Provides personnel access to feed and waveguide components	NA
Phase Shifter Control Unit	Allows adjustment of motorized phase shifter	Scientific-Atlanta (special)

Table 5-1. Special Tools and Test Equipment - Continued

Item	Description	Supplier/Model
Multimeter	0 - 1000V 0 - 10 A 0 - 100 Megohms	Fluke 77 or Equivalent

NOTE

All test equipment should be checked for calibration before use.

5-3 PERIODIC MAINTENANCE.

Periodic maintenance required to maintain the equipment in functional operating condition is provided in Table 5-2. Refer to paragraph 5-4 for maintenance procedures.

Consumable materials required to accomplish prescribed maintenance are listed in Table 5-3. Equivalent items may be used if recommended items are not available.

Table 5-2. Periodic Maintenance Chart

Requirement	Interval
Routine Inspection	
1. External Surfaces	S
2. Connectors	S
3. Fasteners	S
4. Hardware	S
5. Operator Controls	S
6. Wiring/Cable Assemblies	S
7. Pressurization System Inspection	B
8. Feed Radome Inspection	B
Adjustments	
1. Tracking Modulation Adjustment	S

Table 5-2. Periodic Maintenance Chart - Continued

Requirement	Interval
Cleaning	
1. External Surfaces	S
2. External Controls/Receptacles	S
3. Internal Receptacles/Circuit Boards	S
4. Blower Screens	A/R

Legend: D-Daily; W-Weekly; B-Bimonthly; M-Monthly; Q-Quarterly; S-Semiannually; A-Annually; A/R-As Required

Table 5-3. Consumable Materials List

Nomenclature	Specification
Alcohol, Isopropyl	TT-1-735
Cheesecloth	CCC-C-440
Spray-type Contact Cleaner	None

5-4 PREVENTIVE MAINTENANCE.

The following procedures provide for routine inspection and preventive maintenance for the Antenna Assembly and RF Electronics Unit.

5-4.1 Routine Inspection. Routine inspection requires cleaning and inspection to prove serviceability. Routine inspection items are listed in Table 5-4.

WARNING

Dangerous voltages are present on exposed terminals. Remove power before performing any routine inspections. Care must be exercised to avoid contact with these dangerous voltages. Failure to comply with this warning can result in serious injury or death.

Table 5-4. Routine Inspection

Inspection Item	Procedure
Exterior Surfaces	Inspect for dust, dirt, lubricants, or other foreign matter, worn spots or deep scratches on surfaces, corrosion, marred protective finish exposing bare metal; missing, incorrect, illegible or obliterated markings, decals, or reference designators.
Connectors	Inspect for broken, loose, bent, corroded, or missing pins; cracked insulator inserts.
Fasteners	Inspect for broken, loose, bent, corroded or missing fasteners.
Hardware	Incorrect screw length; missing screws, nuts, bolts, rivets, lockwashers, and nutplates; screws, nuts, or bolts with stripped threads.
Operating Controls	Verify all operating controls function smoothly without binding, and do not move beyond internal stops. All switches and control knobs must be secured and properly aligned.
Wiring and Cable Assemblies	Inspect for cut, nicked, burned, or abraded assemblies, insulation exposing bare conductor; sharp bends which weaken conductor; points or abrasion not insulated; pinched or damaged wires; broken or loose lacing, tie wraps, loose clamps.

5-4.1.1 Pressurization System Inspection. Perform the following steps to inspect the pressurization system:

a. Purge pressurization system by opening door on reflector hub cover and pulling up gently on pressure relief valves on the four electronics enclosures and the valve or rear of one of the S-band feed horns. Hold each valve open for 1 minute.

b. While purging pressurization system, visually check all components and look into feed can with a flashlight for signs of water condensation.

c. Time pressurization unit for duty cycle to determine if excess leakage has developed.

d. If leakage has developed, repair or replace pressurization system components or pressurization unit.

5-4.1.2 Feed Radome Inspection. Inspection of the feed radome requires use of a bucket truck. Perform the following steps to inspect the feed radome:

a. Inspect feed radome for indication of damage or aging.

b. If feed radome is damaged, temporarily protect feed from excess moisture by taping plastic over feed opening and turning off pressurization unit to feed.

c. Install new radome.

5-4.2 Cleaning. Clean exterior surfaces of the feed assembly as follows:

WARNING

Isopropyl alcohol is flammable. Use isopropyl alcohol only in well-ventilated areas away from energized electrical circuits, heated objects such as soldering irons, or open flames. Avoid excessive inhalation of vapors or prolonged and repeated contact with skin. Wear industrial rubber gloves and industrial safety goggles to avoid contact with skin. Do not take internally. Failure to comply with this warning can cause injury, physical disorder, or death.

CAUTION

Do not use cleaning fluids containing trichloroethylene, trichloroethane, acetone, or petroleum-based cleaners on equipment. Failure to comply with this caution could harm surfaces.

a. Brush dust from front-panel controls and rear receptacles with small paint brush.

b. Wipe surfaces dry with a clean, dry cheesecloth.

c. Clean exterior surfaces with a clean cheesecloth moistened with isopropyl alcohol or a general-purpose detergent. Use care to avoid entry of cleaning solution into interior of unit or into connectors.

d. Clean electrical contacts of connectors with approved spray-type contact cleaner.

e. Clean internal receptacles and circuit boards with hand-controlled, dry-air jet (not more than 15 lbf/in, and a clean, cheesecloth lightly moistened with approved cleaning solvent. Wipe dry with clean cheesecloth.

f. Remove and clean blower screens as necessary.

5-5 OPERATIONAL CHECKOUT.

Operational checkout of the antenna and RF electronics consists of performing the OPERATIONAL CHECKOUT in the System Manual. The antenna subsystem must be tested in the system configuration.

5-6 TROUBLESHOOTING.

Most RF electronics failures result in loss of signal or ability to autotrack. When a problem develops with the S-band tracking channels, the problem can be determined by patching equipment into the affected circuits. Additional checks of tracking performance can be made with a boresight antenna.

Troubleshooting operations require a technician familiar with the system theory of operation and basic tracking antenna and microwave principles.

5-6.1 Troubleshooting Suggestions. Fault detection and isolation in some of the line replaceable units may be accomplished as follows:

5-6.1.1 MONOSCAN® Converter. Faults in the MONOSCAN® Converter are detected by loss of the tracking signal. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by observation of the input to the ACU using a spectrum analyzer.

5-6.1.2 Motorized Phase Shifter. Faults in the motorized phase shifter are detected by loss or degradation of the tracking signal. Isolation is accomplished by interpretation of indications at the ACU front panel and results of tests using the phase shifter control unit.

5-6.1.3 Low-Noise Amplifier. Faults in an LNA are detected by loss or degradation of the tracking or data signal. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by observation of LNA output with a spectrum analyzer.

5-6.1.4 Waveguide Switch Motor. Faults in a waveguide switch are detected by operational failure of the switch. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by continuity check of the motor.

5-6.2 Troubleshooting Procedures. Troubleshooting procedures are described in Table 5-5. When an abnormal indication is obtained in use or in the operational check, this table will indicate the most likely causes and their solutions.

Table 5-5. Troubleshooting Chart

Symptom	Probable Cause	Remedy
No S-band receive signal	Cabling failure	Check cabling.
	Feed power and/or GaAs FET amplifier power not turned on	Check feed power is onin Model 3842 Autotrack Controller and GaAs FET amplifier power is turned on.
	Ice or foreign matter accumulation blocking signal	Remove accumulation of ice or foreign matter.
	Tracking channel electronics failure	Perform troubleshooting in paragraph 5-6.2.1.
	GaAs FET amplifier failure	Perform troubleshooting in paragraph 5-6.2.1.
	If boresight signal source used, antenna system not pointed at boresight antenna system	If signal was being checked by the boresight source, then antenna may be positioned off axis and receiving greatly reduced signal level. Position antenna on axis using previously established positioner coordinates for boresight antennas.
S-band sum channel operative; difference channel inoperative	Cabling failure	Check cabling and power to MONOSCAN® Converter.
	Feed Power and/or GaAs FET amplifier power not turned on	Check Feed power is on at Model 3842 Atotrack Controller.
	Tracking channel electronics failure	Perform troubleshooting procedure in paragraph 5-6.2.1.
	MONOSCAN® Converter failure	Perform troubleshooting procedure in paragraph 5-6.2.1.
	Model 3842 Autotrack Controller failure	Perform troubleshooting per Model 3842 Autotrack Controller manual.
Lack of Pressurization	Pressurization system failure	Inspect pressurization system per paragraph 5-4.1.1.
Damaged or punctured feed radome	Inspect feed radome per paragraph 5-4.1.2.	

Table 5-5. Troubleshooting Chart - Continued

Sympton	Probable Cause	Remedy
Compressor begins to run full time	Damaged or punctured feed	Inspect feed radome per paragraph 5-4.1.2.
	Compressor failure	Repair or replace as necessary.
	Pressurization system failure	Inspect pressurization system per paragraph 5-4.1.1.

CAUTION

When removing a component from pressurized portions of the unit, restore pressure by plugging the appropriate pressure line. This avoids damage to the pressurization unit.

5-6.2.1 Signal Channel Troubleshooting Procedure. Perform the following procedure to check the overall operation of the signal channel:

a. If no receive signal exists, check RF equipment for failure.

(1) Turn on boresight antenna and point antenna at boresight source which is transmitting in RHC polarization.

(2) Using spectrum analyzer, check signal level prior to receiver input.

(3) If no signal is obtained, check for cabling failure.

(4) Repeat step 2. If no signal is obtained, voltage at LNA terminals using voltmeter.

(5) If no voltage exists at LNA terminals, refer to system manual to verify correct system cabling.

(6) Connect spectrum analyzer to each of the outputs of the tracking unit and check for a signal on all channels.

(7) If a signal exists on all channels, the problem is not in the RF equipment. Refer to the system, receiver and converter manuals as appropriate.

b. If a signal exists on data channels, but not on tracking channel, check the tracking unit for failure.

(1) Check that MAIN/ACQ select switch on 3842 Controller is set to MAIN position.

(2) Check that correct voltages are applied to the tracking polarization switch in tracking unit.

(3) Check cable connections.

(4) Offset antenna from boresight by 0.5 degree in both axes.

(5) Check for amplitude modulation in tracking unit outputs.

c. If signals exist at outputs of tracking unit, but modulation is not present when antenna is pointed slightly off boresight (i.e., system won't track), perform the following steps:

(1) Connect signal generator to tracking channel input of tracking unit and check for signal.

(2) If signal exists, adjust phase shifter to achieve proper modulation. Refer to paragraph 5-8, ADJUSTMENTS, for tracking modulation adjustment.

d. If no signal exists at tracking channel input of tracking unit, check feed can.

(1) Check for correct voltages at MS connector terminal.

(2) Select each polarization using the 3842 Controller and verify signal is present on either polarization at output of feed can.

(3) If a signal exists on one polarization, but not the other, remove feed and check cable connections to polarization select switches.

(4) Check all internal feed cabling.

(5) If a signal does not exist at either of the data channel outputs, check that proper voltage exists at LNA terminals.

(6) If proper voltage is obtained, replace LNA.

5-6.2.2 MONOSCAN® Converter Troubleshooting Procedure. Perform the following procedure to check operation of the MONOSCAN® Converter and driver.

WARNING

Dangerous voltages are present on exposed terminals in the Antenna and RF Electronics Unit. To avoid serious injury or death, exercise care to prevent contact with these dangerous voltages.

a. Turn on boresight antenna and point antenna system at boresight source.

b. Offset antenna from boresight by 0.5 degree in both axes.

c. Display tracking signal output of distribution unit on spectrum analyzer. Decrease frequency span to allow peak of the signal to be flat across the screen.

d. Check for small square amplitude modulation in received signal.

e. If modulation is present, troubleshoot receiver per receiver manual.

f. If modulation is not present, refer to Figure 5-8, sheet 9, of the Autotrack Controller Troubleshooting Flowchart located in the Model 3842 Autotrack Controller Manual.

g. If previous tests checked correct, remove and troubleshoot the MONOSCAN® Converter.

5-7 REPAIR.

Repairs consist of removal and replacement. Disassembly should only be performed to the extent necessary to effect replacement of a defective component. Refer to Section VI for assembly drawings.

Level 1 maintenance of the MONOSCAN® Converter, motorized phase shifter, LNAs, and waveguide switch consists of removal and replacement with a new assembly. HMD repair of these items is not practical or cost-effective.

CAUTION

When working on components in the reflector hub, do not lean on components or cables. The semirigid coaxial cables are subject to damage.

CAUTION

When removing a component from pressurized portions of the unit, restore pressure by plugging the appropriate pressure line. This avoids damage to the pressurization unit.

5-7.1 Reflector Repair. The reflector assembly is maintained by keeping the finish in good condition and correcting any corrosion or loosening of fasteners.

5-7.1.1 Finish Repair. Use the following materials and procedure to repair and retouch scratches and other finish problems such as corrosion and flaking:

WARNING

Toluene, Naphtha and Xylene are flammable and toxic and emit harmful vapors. Keep away from heat and open flame. Use adequate ventilation. Avoid breathing of vapors. Wear industrial goggles and rubber gloves to avoid contact with skin and eyes. Failure to comply with this warning may cause injury, physical disorder or death.

Materials

Solvent - Toluene or Naphtha

Detergent - Vel (Colgate-Palmolive Co.)

Thinner - Xylene

Sandpaper - 320 grit wet/dry

Cheesecloth

1-inch paint brush

Wash primer - MIL-P-14504

Zinc chromate - Fed. Spec. TT-P-1757 Composition G

a. Clean entire area around damaged portion with isopropyl alcohol followed by thorough wash with detergent and water. Rinse well and dry with clean cheesecloth. Do not recoat for 30 minutes or until surface is completely dry.

b. Damaged coatings may be repaired by feathering the damaged edges with 320-grit, or finer, sandpaper.

c. If recoating is to be accomplished in hot sunlight or ambient temperature higher than 100 degrees F, thin top coating with XYLENE. If coating is too dry or grainy, add up to 50 percent mineral spirits to slow evaporation rate.

d. Repriming is required if damage extends to bare metal. If repriming is required, apply a thin coat of wash primer and allow to dry for 15 to 30 minutes. Then apply a full coat of zinc chromate and allow to dry for 2 hours. If surface is not smooth after drying, sand with 320-grit sandpaper lubricated with a mild solvent. Remove dust using a cheesecloth lightly coated with a mild solvent.

e. Recoat prepared surfaces using the finishing materials applicable to that assembly. Refer to the assembly drawing in Section VI for specific coating processes and finishes.

5-7.1.2 Fasteners. The fasteners need to be checked to ensure they are in place and have not obviously loosened. If a fastener is found to be loose, or there is cause to check all the fasteners, use a torque wrench to obtain the proper bolt tension. Torque values are given in Table 5-6.

If corrosion of a fastener becomes evident, it should be corrected immediately as follows:

a. Determine extent of corrosion. If base material of fastener is corroded, replace with identical size and type. Refer to drawing's parts list for fastener size and type.

b. Remove any corrosion from the fastener (if reused) and surrounding area with a wire brush.

c. Clean parts with Toluene or Naphtha solvent.

d. For enhanced corrosion resistance of bolted joint, dip fastener into white, water reducible paint; Rust-Oleum No. 6792. This is the same paint supplied in the corrosion prevention kit under Scientific-Atlanta PN 87549.

e. Insert fastener into joint wet and torque as specified in Table 5-6. If fastener fails, replace with identical one meeting Federal Specification FF-S-95C, Grade 5.

f. After fastener is torqued and paint is dry enough to be recoated, spray fastener head, washers and nut with flat white paint, Rust-Oleum No. 2764. This paint is the same as Scientific-Atlanta PN 87550, provided in corrosion prevention kit.

In the case of extensive corrosion of a fastener, i.e., the base material is corroded, replace with identical size and type (SAE Grade 5 steel). Refer to drawing's parts list.

Table 5-6. Recommended Torque Values*

Bolt Size	Foot-Pounds
1/4-20	9
5/16-18	18
3/8-16	30
7/16-14	50
1/2-13	75
9/16-12	110
5/8-11	150
3/4-10	260

*For lubricated or CAD-plated, grade-5 steel bolts.

5-7.1.3 Single-Panel Replacement. When replacing a single panel after the reflector has been assembled, the following procedure should be followed:

a. Looking out from hub, drive pin on the left towards the right until it no longer passes through either of the panels. Similarly drive right pin towards the right until it no longer passes through flange of the panel to be removed.

b. With particular panel supported, along with panel to the left, remove hardware holding panel to the two adjacent panels.

c. Lift panel out of assembly.

NOTE

If the panel to be removed happens to be a spar panel, the associated spar must be removed first.

d. To replace panel, reverse process. Be sure alignment pins are through panels and that panel is pushed down on top of tabs on trusses before tightening bolts holding panels together.

5-7.2 Feed and RF Electronics Repair. Repair of feed and RF electronic parts consists of removal and installation of replacement parts.

5-7.2.1 Feed and RF Electronics Removal Procedures.

5-7.2.1.1 S-Band Coaxial Components Removal. Most S-band tracking channel components have coaxial-type connections. If one of these components has failed and requires replacement, remove the component as follows:

a. Carefully remove cables leading to the enclosure and plug pressurization line.

b. Remove enclosure that houses these components from hub.

c. Disconnect coaxial cables to failed component and remove mounting hardware.

5-7.2.1.2 Waveguide Components Removal. Removal of waveguide components is accomplished as follows:

a. Loosen hardware and O-ring at each waveguide joint as required and save for reassembly.

b. Carefully remove waveguide component.

5-7.2.1.3 S-Band Data Channel GaAs FET Amplifier (LNA) Removal. Removal of the S-band data channel GaAs FET amplifier (LNA) is accomplished as follows:

a. Remove LNA power by pressing Model 3842 Autotrack Control Unit FEED PWR switch/indicator.

b. Turn off waveguide pressurization supply.

c. Disconnect RF cable and power cable from LNA.

d. Using a 7/16-inch wrench, remove waveguide-to-LNA fasteners and retain fasteners and waveguide gasket.

CAUTION

Handle the LNA with care to prevent damage.

e. Remove S-band LNA.

f. Cover waveguide port to prevent dirt and/or moisture from entering waveguide.

g. Turn on waveguide pressurization supply.

5-7.2.1.4 S-Band Tracking Channel GaAs FET Amplifier (LNA) Removal. Removal of the S-band tracking channel GaAs FET amplifier (LNA) is accomplished as follows:

a. Remove LNA power by pressing Model 3842 Autotrack Controller FEED PWR switch/indicator.

b. Turn off feed can pressurization supply.

c. Disconnect RF cable and power cable from S-band feed can.

d. Remove S-band feed can.

e. Cover waveguide ports to prevent dirt and/or moisture from entering waveguide.

f. Turn on feed can pressurization supply.

g. Take feed can to lab and remove feed from feed can.

h. Using a screwdriver, disconnect coaxial cables and mounting hardware as required.

CAUTION

Handle the LNA with care to prevent damage.

i. Remove S-band LNA.

5-7.2.1.5 Feed Removal. Removal of the feed requires use of a bucket truck and a crew of 1 or 2. Removal of the feed is accomplished as follows:

a. Point antenna and position bucket truck to reach feed area.

b. Turn off pressurization to feed.

c. Disconnect all power, control, and coaxial cables leading into feed.

d. Remove radome.

e. Remove S-band feed can.

NOTE

After removing feed, ensure all waveguide ports are sealed.

f. Remove feed assembly from feed can.

5-7.2.1.6 Feed Components Removal. Removal of feed components is accomplished as follows:

a. Remove radome, feed can, and feed per paragraph 5-7.2.1.5.

b. Remove brackets and cables, as required, to remove desired component.

5-7.2.2 Feed and RF Electronics Installation Procedures.

5-7.2.2.1 S-Band Coaxial Components Installation. Install S-band coaxial components as follows:

CAUTION

When mating 3 mm RF connectors, ensure that the male center pin fits the center hole of the female connector. Tighten only to 7 to 10 inch-pounds of torque.

NOTE

If the amplifier is being replaced, check for correct polarity of bias voltage wires.

a. Install mounting hardware and connect coaxial cables to component.

b. Install enclosure housing S-band coaxial components on hub.

c. Install cables leading to enclosure and reconnect pressurization line.

5-7.2.2.2 Waveguide Components Installation. Installation of waveguide components is accomplished as follows:

a. Clean flange.

b. Coat O-ring with small amount of silicone grease.

c. Orient waveguide properly and insert all screws before tightening. Do not overtighten.

5-7.2.2.3 WR430 S-Band GaAs FET Amplifier (LNA) Installation. Installation of the WR430 S-band GaAs FET amplifier is accomplished as follows:

a. Remove waveguide port protective covering.

CAUTION

Handle LNA with care to prevent damage.

b. Using silicone grease, lightly grease retained waveguide gasket and install it in LNA waveguide flange groove.

c. Position LNA and align waveguide flange with LNA waveguide flange.

d. Install retained waveguide-to-LNA fasteners. Do not tighten fasteners.

e. Ensure proper waveguide-to-LNA alignment and tighten fasteners.

f. Tighten LNA mounting fasteners.

g. Connect RF cable and power cable.

h. Restore waveguide pressurization.

i. Restore LNA power by pressing Model 3842 Autotrack Control Unit FEED PWR switch/indicator.

5-7.2.2.4 S-Band Tracking Channel GaAs FET Amplifier (LNA) Installation. Installation of the WR430 S-band GaAs FET amplifier is accomplished as follows:

CAUTION

Handle LNA with care to prevent damage.

a. Mount LNA on bracket with existing hardware.

b. Position bracket in feed can and install mounting hardware.

CAUTION

When mating 3 mm RF connectors, ensure that the male center pin fits the center hole of the female connector. Tighten only to 7 to 10 inch-pounds of torque.

c. Connect coaxial cables as required.

d. Install feed per paragraph 5-7.2.2.5.

5-7.2.2.5 Feed Installation. Installation of the feed requires use of a bucket truck and a crew of 1 or 2. Installation of the feed is accomplished as follows:

CAUTION

When installing feed into feed can, handle dipole elements carefully to prevent equipment damage.

a. Install feed into feed can.

b. Point antenna and position bucket truck to reach feed area.

c. Install feed can at focal point of reflector.

d. Install radome.

e. Connect RF coaxial and power cables.

f. Restore waveguide pressurization.

5-7.2.2.6 Feed Components Installation. Installation of feed components is accomplished as follows:

a. Mount all removed components with original hardware.

b. Install all removed brackets and cables.

c. Slide feed unit into feed can.

d. Install feed, feed can, and radome per paragraph 5-7.2.2.5.

5-7.3 Testing. Testing after repair consists of performing the operational check in paragraph 5-5.

5-8 ADJUSTMENTS.

The following paragraphs provide adjustments initially made at the factory. Readjustment should be required only upon replacement of faulty components.

5-8.1 Tracking Modulation Adjustment. The sum and difference channels of the S-band tracking RF electronics must be properly phase-matched as described in Section IV, Theory of Operation. Although initially set at the factory, aging of the electronic components may cause the relative phase of the sum and difference channels to drift over long periods of time. This adjustment should be checked on a 6-month basis initially to determine at what rate the insertion phase of the preamplifiers drifts.

The object of the phase-matching adjustment is to maximize the tracking modulation which will occur when the maximum difference exists between the azimuth 0 and azimuth 180 (or elevation 0 and elevation 180) levels on the displayed IF signal envelope.

Perform the following procedure to monitor and/or adjust the phase-match condition for the S-band channel:

a. Using dual-channel scope, display 20 MHz output of tracking receiver on channel 1 and Scan Code from 3842 (TP2 on AUTO "A" Bd, A1A2) on channel 2. Trigger scope using channel 2.

b. Receive appropriate transmitted test signal from boresight antenna test system.

c. Route received, downconverted signal through tracking receiver. A 20 MHz IF output signal envelope from receiver should display on oscilloscope.

d. Align antenna with boresight source using Autotrack mode.

e. When antenna is pointed off axis, tracking signal envelope displayed on oscilloscope will show a stairstep waveform which repeats at approximately a 1,000 Hz rate. This waveform corresponds to the amplitude-modulated tracking signal for each azimuth 0, elevation 0, azimuth 180, elevation 180 cycle as described in the Principles of Operation, Section IV. Motion off of boresight in AZ will cause a change in 20 MHz signal during low portion of scan code. Motion in EL will cause a change during high portion of scan code.

f. Move antenna slightly off axis in Manual mode to display a cleanly modulated signal (no more than 0.3 degree for S-band).

NOTE

Attach phase shifter to control box via cable 1W2 (refer to System Cabling Diagram in Section VI, and Figure 5-1).

g. Set PHASE SHIFTER switch to INCREASE position to move phase shifter in INCREASE direction and observe tracking modulation envelope on oscilloscope.

h. If modulation level decreases in this direction ("stairstep" flattens out), set PHASE SHIFTER switch to DECREASE position to run phase shifter in opposite direction until maximum modulation level is observed. The end-to-end travel time for the S-band motorized phase shifter is about 3 minutes.

NOTE

Autotrack operation should be checked to ensure that phase reversal of autotrack error signals has not been produced from this adjustment. If so, the phase shifter will have to be adjusted 180 degrees, which will produce another modulation maximum, but with the correct error signal polarity.

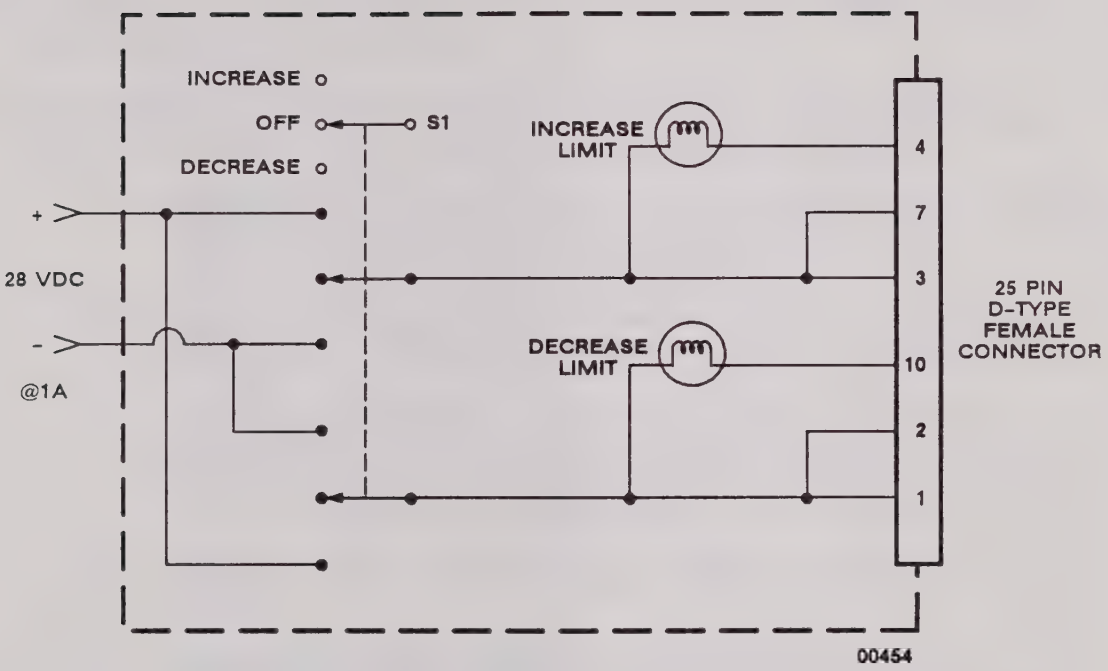


Figure 5-1. Phase Shifter Control Schematic

Section VI

DRAWINGS, DIAGRAMS, AND PARTS LISTS

6-1 INTRODUCTION.

This section provides schematics, drawings, and parts lists for the S-Band TT&C Antenna and RF Subsystem. Drawings are presented in family tree order, except schematic diagrams which are presented at the beginning of this section; cables at the end of the section. A parts list follows each respective assembly drawing, unless parts are listed on the drawing.

6-2 PARTS LIST AND ASSEMBLY DRAWINGS.

The parts list describes the parts illustrated by the assembly drawings. Use the information for identifying and requisitioning parts, and as an aid in disassembly/assembly procedures.

6-2.1 Explanation of Parts Lists Column Headings. The parts list is separated into main groups or assemblies and keyed to associated assembly drawing(s) by item or find number and/or reference designation.

a. REF DESIG. This column lists the item, find number, or reference designation by which each part is called out on the illustration related to the parts list. Reference designation may also be found on the applicable schematic diagram.

b. PART NUMBER/DESCRIPTION. This column contains the Scientific-Atlanta part number and a brief electrical or mechanical description of the part.

c. QUANTITY PER ASSEMBLY. This column contains the number of units of this part in the group or assembly. As required, (A/R) abbreviation indicates that the quantity required is determined when the unit is installed/repaired. The notation (.) indicates that this part is not assigned/used and has a quantity of zero.

d. VENDOR. This column contains an alpha code for the vendor. If this column is blank, the vendor is Scientific-Atlanta (CAGE/FSCM 10110).

e. MANUFACTURER'S PART NUMBER. This column contains the manufacturer's part or identification number. If this column is blank, order by description.

f. CAGE CODE. This column contains Commercial and Government Entity (CAGE). The code numbers are from the Defense Logistics Agency CAGE Name-to-Code and Code-to-Name handbooks effective on the publication date of this manual.

g. APPLICABLE DOC NUMBER. This column lists applicable documents related to the part number, i.e., schematics, etc.

h. REV. This column contains the current revision level of this part number.

i. ECN. This column lists ECN activity recorded against this part number.

6-2.2 Ordering Parts. When ordering parts from Scientific-Atlanta, always include the Scientific-Atlanta part number, the part description, the unit serial number, unit name, subassembly, part manufacturer, and manufacturer's part number.

6-2 DRAWING INDEX.

A listing of drawings is shown in Table 6-1 by drawing number in the first column. The alpha character following the drawing number represents the current revision level (dash indicates the original drawing).

Table 6-1. Drawing Index

Drawing Number	Title	Page Number
445874	System Cabling Diagram (A3)	6-5
446538	RF Interconnect Schematic Diagram (A2A5)	6-7
446536	Feed Schematic, S-Band TT&C (A2A4A2)	6-9
445884	10-Meter Antenna Assembly (A2A4)	6-11
446120	10-Meter Parabolic Reflector Assembly (A2A4A1)	6-15
446535	Feed Assembly, S-band TT&C (A2A4A2)	6-19
198409	MONOSCAN® Converter Model 251-2B (A2A4A2A4)	6-29
445486	Dipole Assembly (A2A4A2E1 to E4)	6-35
445495	Feed Horn (A2A4A2E5)	6-39
446537	Waveguide Installation (A2A6)	6-45
446539	LNA Assembly, S-Band TT&C (A2A6A5)	6-59
445877	Low-Noise Amplifier (A2A6A5A1, A2A6A5A2)	6-65
445796	Rotary Joint, Single Channel (A2A6E1, A2A6E2)	6-67
445873	S-Band Waveguide Diplexer (A2A6FL1)	6-69
432110 432112 432114 432116 (352149)	Cable Assembly, Coaxial, 7-inch (A2A4A2W13, A2A4A2W14, A2A4A2W17); 8-inch (A2A4A2W11, A2A4A2W12); 9-inch (A2A4A2W15); 10-inch (A2A4A2W16)	6-71

Table 6-1. Drawing Index - Continued

Drawing Number	Title	Page Number
432610 (352146)	Cable Assembly, Coaxial, 7-inch (A2A6A5W17)	6-75
433205 433210 433212 433232 (421357)	Cable Assembly, Coaxial, 4.5-inch (A2A6A5W15); 7-inch (A2A6A5W18); 8-inch (A2A6A5W19); 18-inch (A2A6A5W16)	6-79

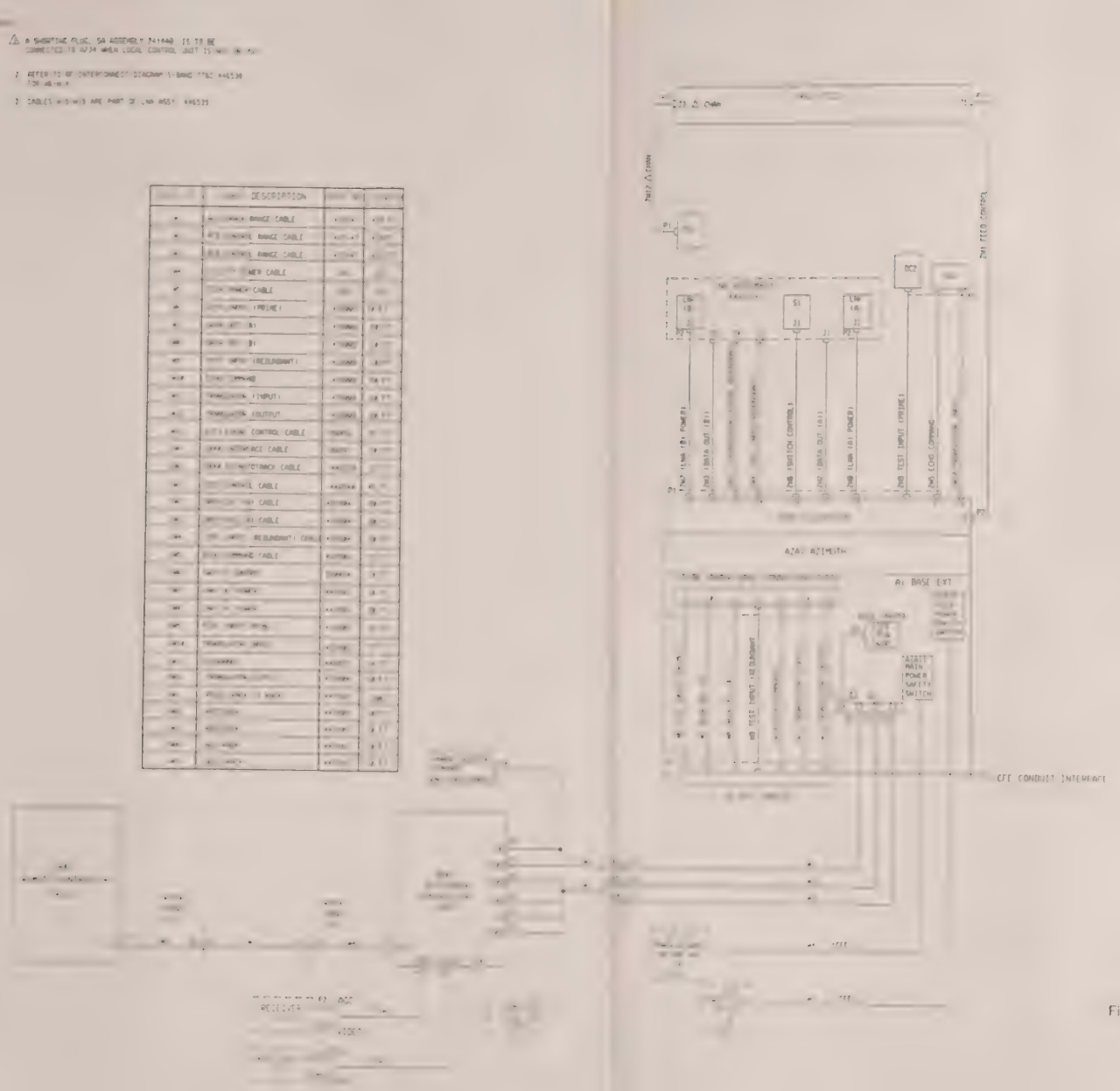


Figure 6-1. System Cabling Diagram SK445874-P4 [A3]

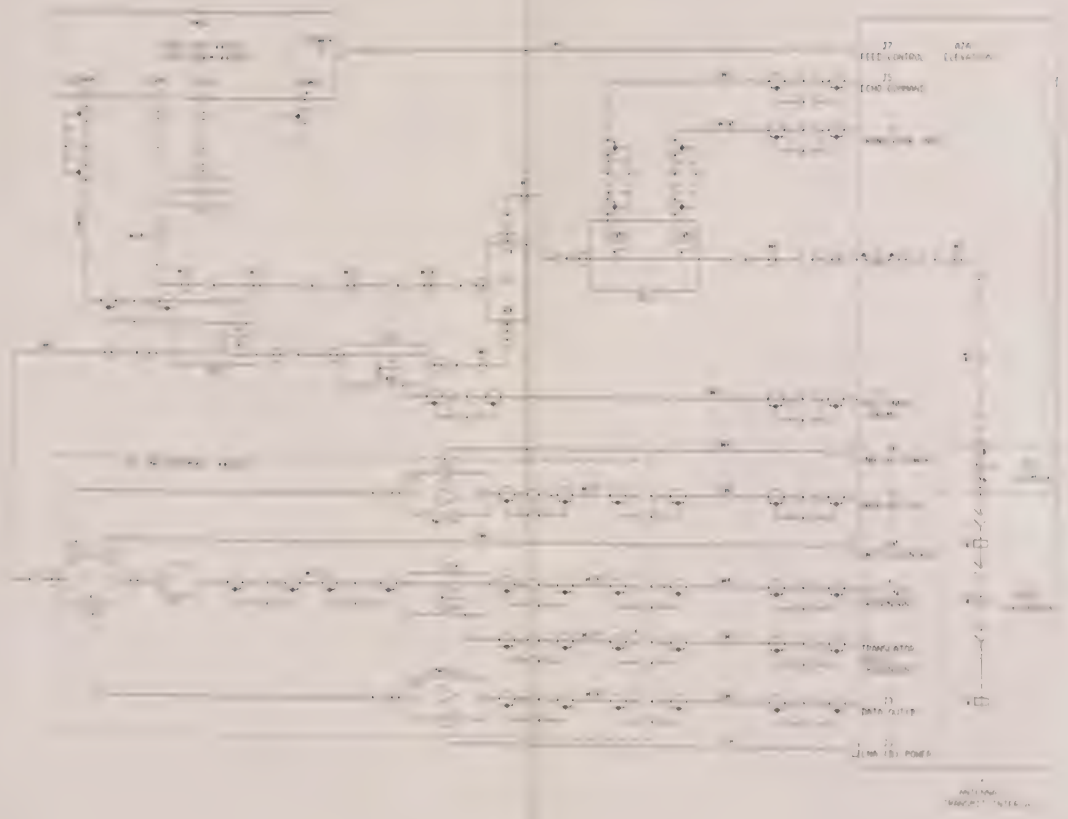


Figure 6-2. RF Interconnect Schematic Diagram, 446538 [A2A5]

NOTES:

1. ITEM 5 OF ASSEMBLY 446536.
2. PART OF ITEM A1.
3. POLARIZATION SENSE APPLIES WHEN FEED IS IN REFLECTOR.
4. ADJUST LENGTH OF W13 TO PHASE MATCH ΔEL PATH TO ΔAZ PATH TO WITHIN 5° AT 2211 MHz.

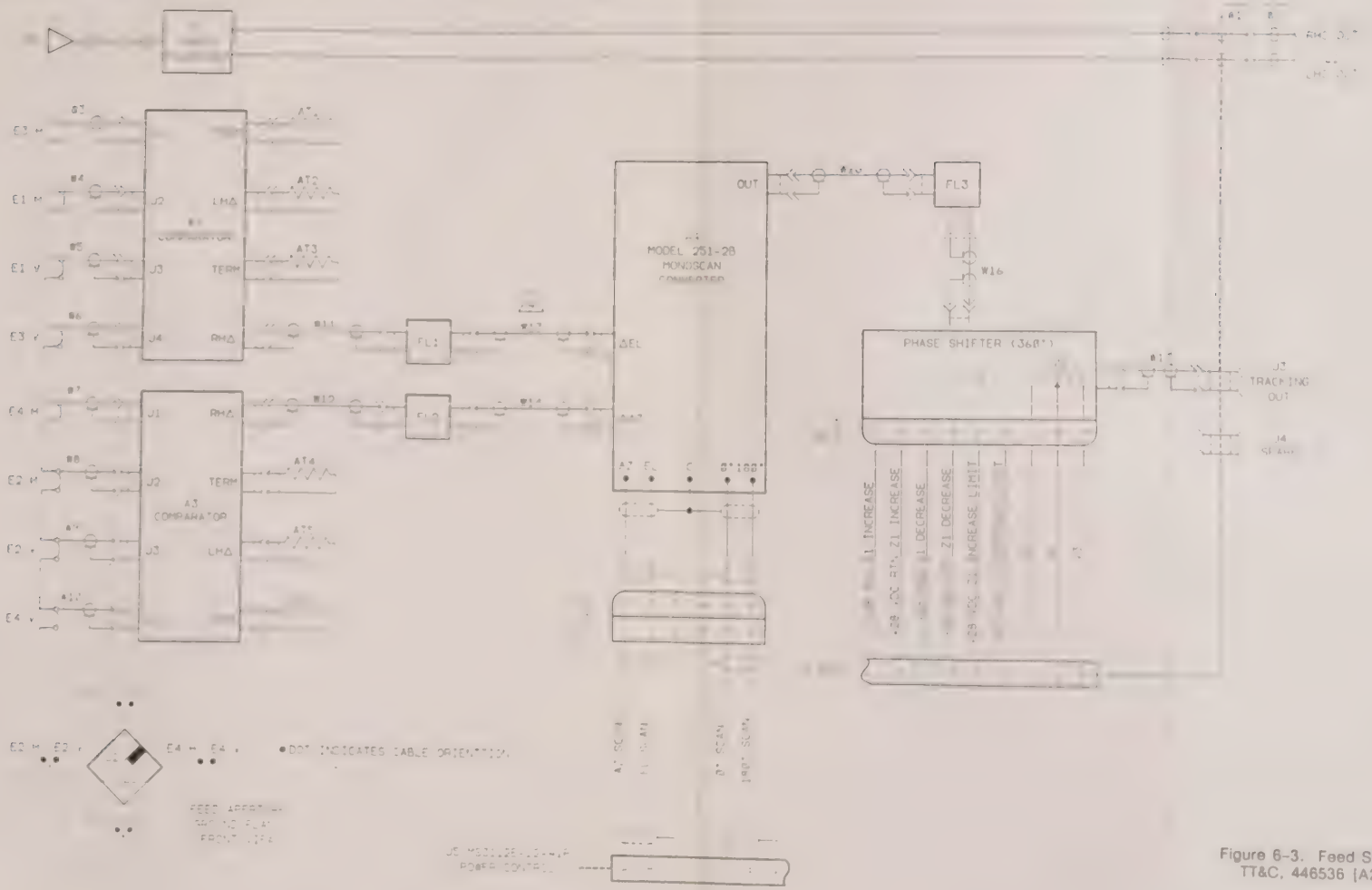


Figure 6-3. Feed Schematic, S-Band TT&C, 446536 [A2A4A2]

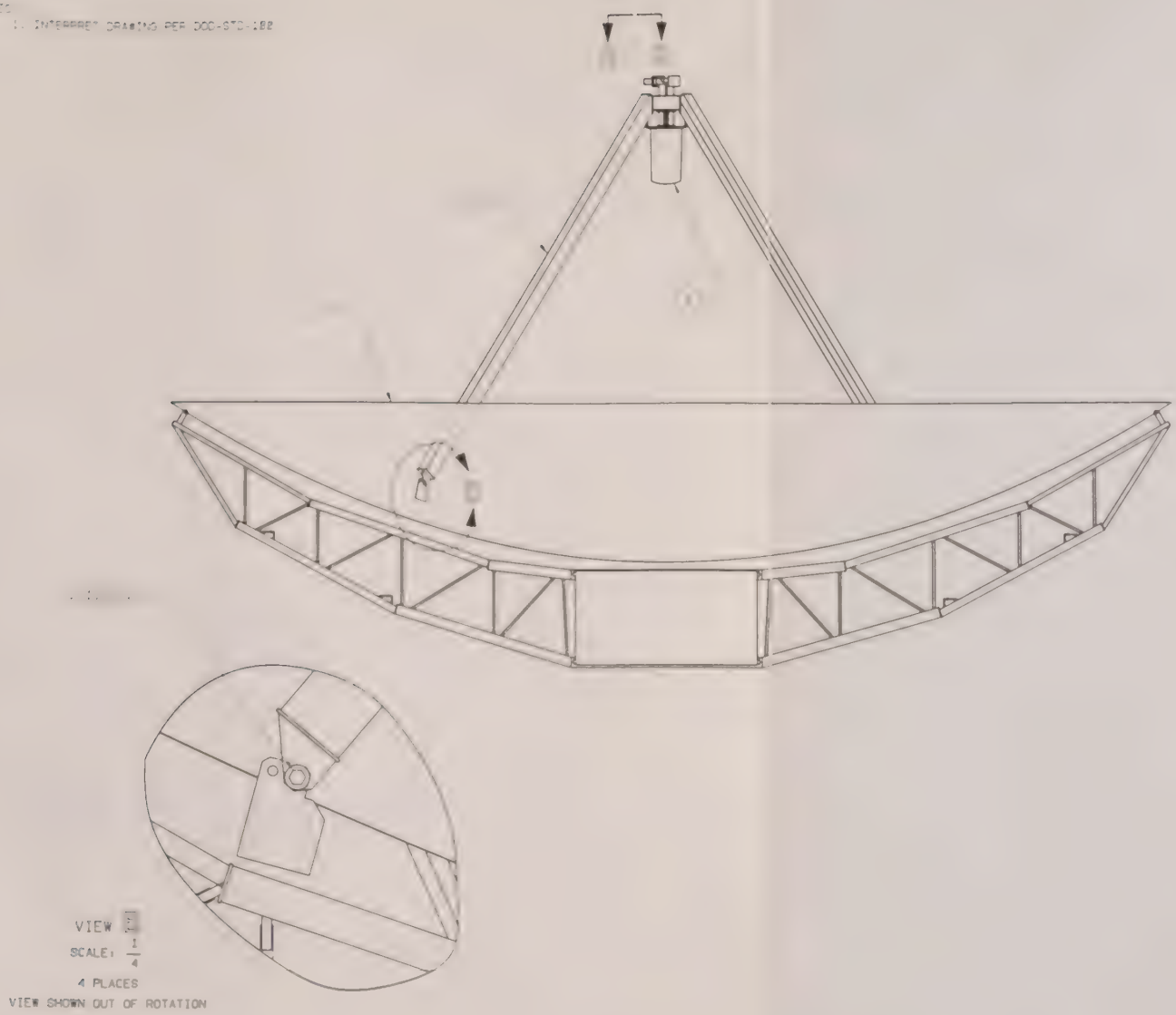


Figure 6-4. 10-Meter Antenna Assembly, SK445884 [A2A4] (Sheet 1 of 2)

Figure 6-4. 10-Meter Antenna Assembly, SK445884 [A2A4]
(Sheet 2 of 2)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
1	M446120 10 METER PARABOLIC REFLECTOR ASSEMBLY	1.00		PER SA DWG 446120	EA	10110	446120	
2	M446535 FEED ASSEMBLY, S-BAND TT & C	1.00		PER SA DWG 446535	EA	10110	446535	
3	M446146 SPAR,FEED SUPPORT	4.00		PER SA DWG 446146	EA	10110	446146	
10	M444478 SCREW 1/2-13 X 2 1/4 CAP, HEX HD SST	12.00		MS35307-416	EA	10110		
11	M073286 WASHER-1/2-.531 1.062.095 CAD PL STL	24.00		PER SA SPEC 681010	EA	80204		
13	M356513 NUT 1/2-13 HEX SST	12.00		MS51971-5	EA	98291	356513	
20	M413918 SCREW 3/4-10 X 1.75 CAP HEX HD SST	4.00		MS35307-486	EA	96906	413918	
21	M073292 WASHER- 3/4- .812 1.469 .134 CAD PL STL	8.00		PER SA SPEC 681010	EA	80204		
23	M193487 NUT 3/4-10 UNC-2B PLAIN HEX SST	4.00		MS51971-8	EA	96906	193487	

*** E N D O F R E P O R T ***

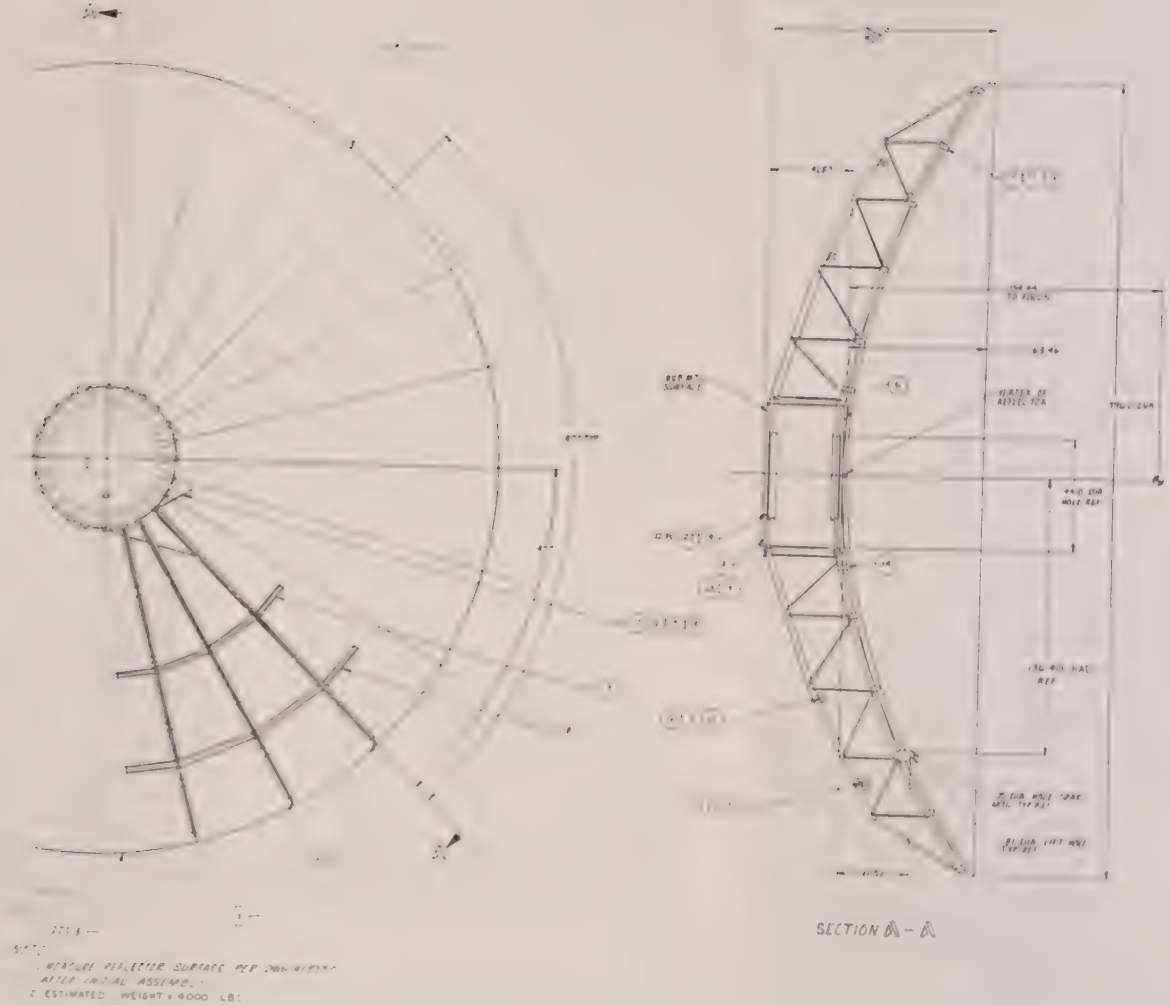


Figure 6-5. 10-Meter Parabolic Reflector Assembly, SK446120-P3 [A2A4A1] (Sheet 1 of 3)

Figure 6-5. 10-Meter Parabolic Reflector Assembly, SK446120-P3 [A2A4A1]
(Sheet 2 of 3)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
1	M445940 TRUSS,10 METER REFLECTOR UNSHAPED	20.00		PER SA DWG 445940	EA	10110	445940	
2	M445964 TRUSS,SPAR,10 METER REFLECTOR UNSHAPED	4.00		PER SA DWG 445964	EA	10110	445964	
3	M329849 HUB, 10 METER--3300	1.00		PER SA DWG 329849	EA	10110	329849	
4	M446122 SPAR PANEL ASSEMBLY,10 METER PARABOLIC REFLECTOR	4.00		PER SA DWG 446122	EA	10110	446122	
5	M445995 PANEL ASSEMBLY,10 METER PARABOLIC REFLECTOR	19.00		PER SA DWG 445995	EA	10110	445995	
6	M424111 COVER, FRONT, HUB - 10 M.	1.00		PER SA DWG 424111	EA	10110	424111	
7	M445998 BRACE,TRUSS,10 METER REFLECTOR	24.00		PER SA DWG 445998	EA	10110	445998	
8	M445999 BRACE, LONG TRUSS,10 METER REFLECTOR	24.00		PER SA DWG 445999	EA	10110	445999	
9	M444973 WASHER,1/2-.531 1.062 .095,SST	96.00		PER ANSI B18.22.1	EA	80204		
10	M356459 SCREW 3/8-16 X 1 1/4 CAP HEX HD SST	264.00		MS35307-362	EA	96906	356459	
11	M088428 WASHER- 3/8- .406 .812 .065 AUS SST	528.00		ANSI B18.22.1	EA	80204		
12	M076795 NUT 3/8-16 UNC-2B,PLAIN-HEX,SST	272.00		PER MS51971-3	EA	96906		
13	M446414 SCREW, SST, 1/2-13 UNC-2A X 2 1/4	48.00	VEN373748	PER SA DWG 446414	EA	10110	446414	
14	M071654 PIN SPRING 3/16 DIA X 1 IN. LG SLTD CD P	24.00		PER MS16562-50	EA	96906		
15	M136777 BRACE, TORSIONAL REFLECTOR	8.00		PER SA DWG 136777	EA	10110	136777	
16	M136779 TORISIONAL BRACE WASHER	8.00		PER SA DWG 136779	EA	10110	136779	

Figure 6-5. 10-Meter Parabolic Reflector Assembly, SK446120-P3 [A2A4A1]
(Sheet 3 of 3)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV	ECN
17	M356514 SCREW 3/8-16 X 1.50 CAP HEX HD SST	8.00		MS35307-364	EA	98291	356514		
19	M072442 SCREW 10-24 X 3/8 PAN HD, SST	12.00		PER MS51957-61	EA	96906			
20	M174557 WASHER LOCK SPLIT SST NO 10	12.00		MS35338-138	EA	96906	174557		
21	M078600 NOT ASSIGNED			NOT ASSIGNED	EA	10110			
22	M445997 PANEL,DECAL,10 METER UNSHAPED REFLECTOR	1.00		PER SA DWG 445997	EA	10110	445997		

*** E N D O F R E P O R T ***

NOTES:

1. DISASSEMBLE A1 AND INSTALL ITEM 5 BETWEEN FLANGES OF A1.
2. INSTALL "O" RING PROVIDED WITH ITEM A1.
3. WIRE, CABLE, AND LABEL PER SCHEMATIC 446536.
4. CUT TO FIT AT ASSEMBLY.
5. APPROXIMATE FAR-FIELD DIMENSION.
6. ADJUST DIPOLE ELEMENT TO 2.25 INCH NOMINAL (TIP TO TIP AND POSITION REFLOW BEAD FOR OPTIMAL VSWR.

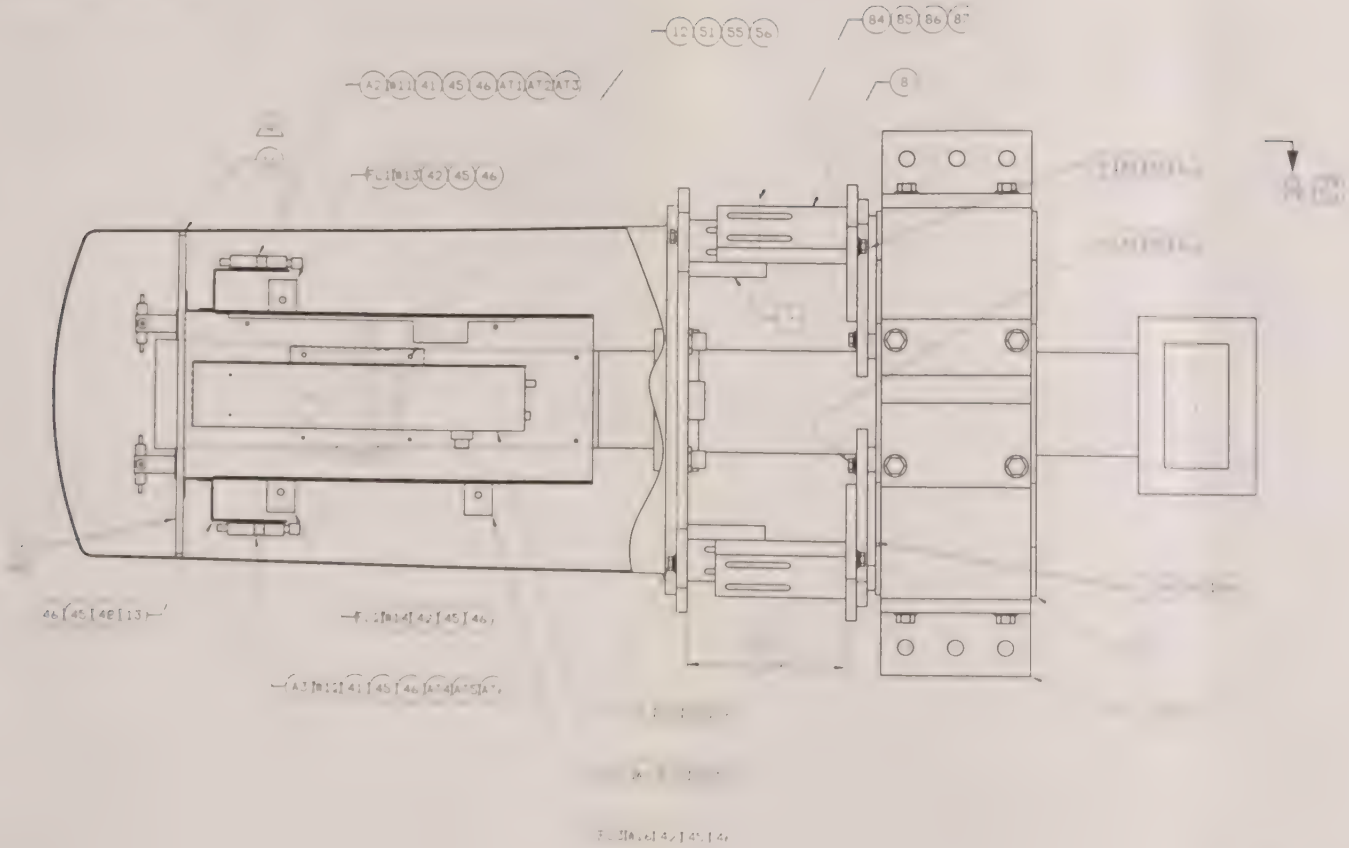


Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2] (Sheet 1 of 8)

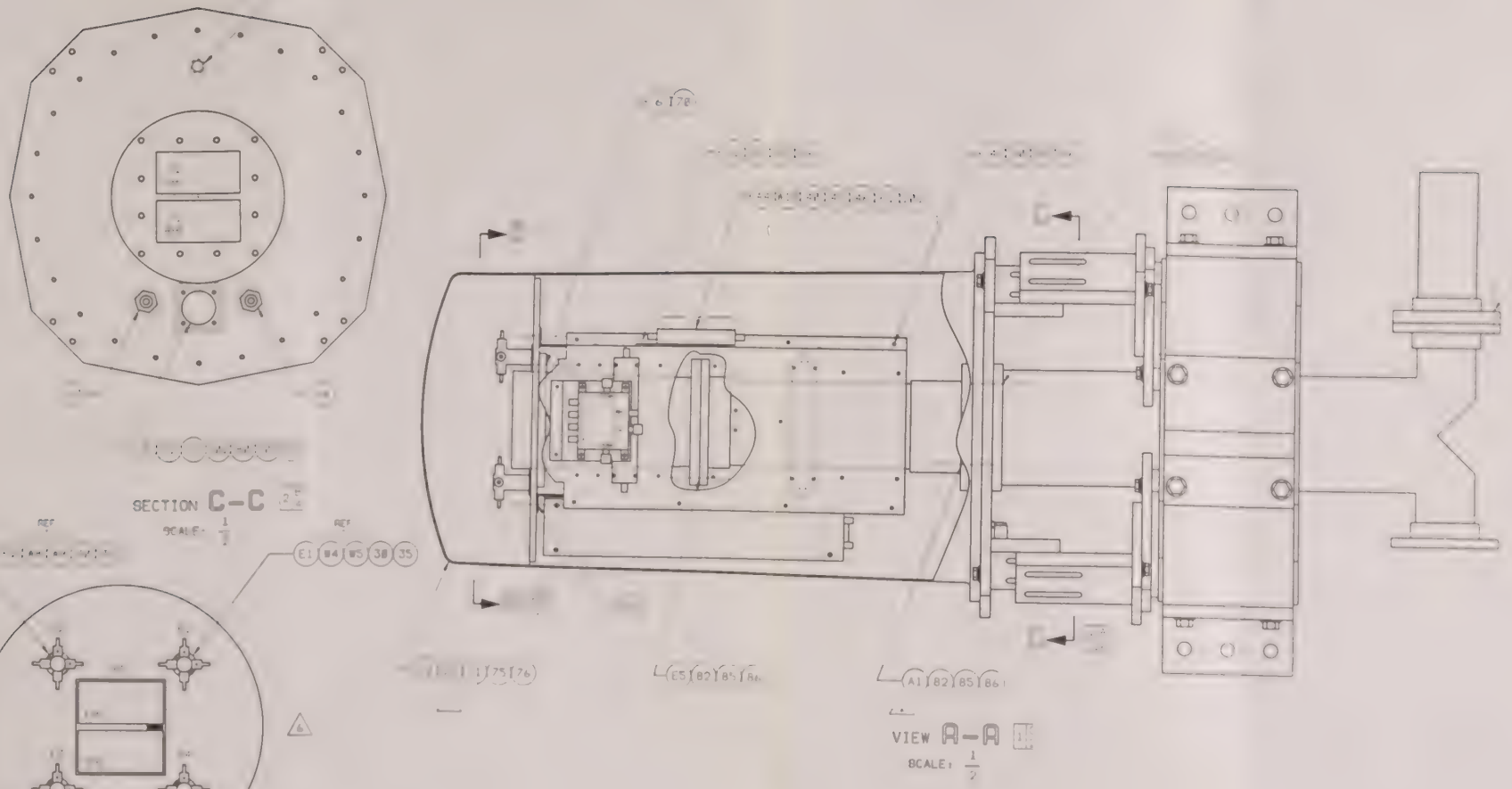


Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 (A2A4A2) (Sheet 2 of 8)

Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 3 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
AT1	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
AT2	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
AT3	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
AT4	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
AT5	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
AT6	M445026 TERMINATION,SMA,5 WATT,50 OHM	1.00	VEN952644	MDC1090M	EA			
A1	M445011 HYBRID POLARIZER,WR340/WR430	1.00	VEN037428	AMC 1059	EA			
A2	M444992 COMPARATOR,DIFFERENCE CHANNEL,CIRCULAR	1.00	VEN354640	AZ2180190	EA			
A3	M444992 COMPARATOR,DIFFERENCE CHANNEL,CIRCULAR	1.00	VEN354640	AZ2180190	EA			
A4	M198409 MONOSCAN CONVERTER MODEL 251-2B	1.00		PER SA DWG 198409	EA	10110	198409	
E1	M445486 DIPOLE ASSEMBLY	1.00		PER SA DWG 445486	EA	10110	445486	
E2	M445486 DIPOLE ASSEMBLY	1.00		PER SA DWG 445486	EA	10110	445486	
E3	M445486 DIPOLE ASSEMBLY	1.00		PER SA DWG 445486	EA	10110	445486	
E4	M445486 DIPOLE ASSEMBLY	1.00		PER SA DWG 445486	EA	10110	445486	
E5	M445495 FEED HORN	1.00		PER SA DWG 445495	EA	10110	445495	
FL1	M444699 COAXIAL FILTER 2.2-2.4 GHZ,-40DB @2120	1.00		AMD2308-E6-2	EA	24022		

Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 4 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
FL2	M444699 COAXIAL FILTER 2.2-2.4 GHZ,-40DB @2120	1.00		AMD2308-E6-2	EA	24022		
FL3	M444699 COAXIAL FILTER 2.2-2.4 GHZ,-40DB @2120	1.00		AMD2308-E6-2	EA	24022		
J3	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
J4	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
J5	M170934 CONNECTR 3112E 22 41P	1.00		MS3112E-22-41P	EA	96906	170934	
P1	M416058 CONN RECT BODY W/O CONTACTS 6 POS PLUG	1.00	VEN938953	350715-1	EA	00779	416058	
P1	M416059 CONN RECT BODY W/O CONTACTS 6 POS RECP	1.00	VEN938953	350781-1	EA	00779	416059	
P2	M416059 CONN RECT BODY W/O CONTACTS 6 POS RECP	1.00	VEN938953	350781-1	EA	00779	416059	
P3	M088894 CONN RECT SHELL WITH CLAMP FOR 9-COND	1.00		DE-24657	EA	71468		
W11	M432112 CABLE SMA MALE TO SMA MALE 8.0 IN.	1.00		PER SA DWG 432112	EA	10110	432112	
W12	M432112 CABLE SMA MALE TO SMA MALE 8.0 IN.	1.00		PER SA DWG 432112	EA	10110	432112	
W13	M432110 CABLE SMA MALE TO SMA MALE 7.0 IN.	1.00		PER SA DWG 432110	EA	10110	432110	
W14	M432110 CABLE SMA MALE TO SMA MALE 7.0 IN.	1.00		PER SA DWG 432110	EA	10110	432110	
W15	M432114 CABLE SMA MALE TO SMA MALE 9.0 IN.	1.00		PER SA DWG 432114	EA	10110	432114	
W16	M432116 CABLE SMA MALE TO SMA MALE 10.0 IN.	1.00		PER SA DWG 432116	EA	10110	432116	
W17	M432110 CABLE SMA MALE TO SMA MALE 7.0 IN.	1.00		PER SA DWG 432110	EA	10110	432110	

Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 5 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
Z1	M444991 PHASE SHIFTER,MOTORIZED,DC-4.0 GHZ	1.00	VEN001722	AR4346	EA			
1	M058212 MOUNTING BAR--SERIES 70 FEED	4.00		PER SA DWG 58212	EA	10110	058212	
2	M112235 FEED RING--3570	1.00		PER SA DWG 112235	EA	10110	112235	
3	M355452 TAB SPAR	4.00		PER SA DWG 355452	EA	10110	355452	
4	M445491 MOUNT, FEED COMPONENTS	2.00		PER SA DWG 445491	EA	10110	445491	
5	M446575 PLATE, FEED MOUNT	1.00		PER SA DWG 446575	EA	10110	446575	
6	M445494 GROUND PLANE FEED	1.00		PER SA DWG 445494	EA	10110	445494	
7	M445496 ADJUSTER, X - Y	4.00		PER SA DWG 445496	EA	10110	445496	
8	M445497 ADJUSTER Z, PRIME	4.00		PER SA DWG 445497	EA	10110	445497	
9	M445498 ADJUSTER Z, SECONDARY	4.00		PER SA DWG 445498	EA	10110	445498	
11	M446573 MOUNT, MONOSCAN CONVERTER	1.00		PER SA DWG 446573	EA	10110	446573	
12	M446574 MOUNT, PHASE SHIFTER	1.00		PER SA DWG 446574	EA	10110	446574	
13	M445492 MOUNT, PROCESSOR	2.00		PER SA DWG 445492	EA	10110	445492	
14	M445078 VALVE,RELIEF 2.0 PSI 1/4 NPTM ALUM	1.00	VEN414629	559A-2M-2	EA			
15	M086369 TAPE TEFLON ANTISEIZE .0035 THK 1/2 WIDE			MIL-T-27730 SIZE II	EA	81349		
16	M444826 EMI SHEILD GASKET C2 EMI 6 X 6 MM PSA			5779-1911-1	EA			

Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 6 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
22	M445764 RADOME, FEED	1.00		PER SA DWG 445764	EA	10110	445764	
23	M069211 NEOPRENE SHT 1/16 THK 36WIDE 28FT LG	2.00		ASTM D-2000 1-BC-610	SF	00141		
24	M445064 TERMINATION,WR430,60W,6" LG	1.00	VEN367543	1130195	EA			
30	M072295 SCREW 2-56 X 3/16 PAN HD,SST	8.00		PER MS51957-2	EA	96906		
35	M073263 WASHER NO. 2 LOCK, EXT TOOTH, CAD PL STL	8.00		ANSI B18.21.1	EA	80204		
40	M072321 SCREW 4-40 X 3/8 F HD,82 DEG,SST	8.00		PER MS51959-15	EA	96906		
41	M072327 SCREW 4-40 X 3/8 PAN HD,SST	8.00		PER MS51957-15	EA	96906		
42	M084891 SCREW 4-40 X 1 3/8 PAN HD, SST	12.00		PER MS51957-122	EA	96906		
45	M083732 WASHER-NO. 4- .125 .312 .032 CAD PL STL	28.00		ANSI B18.22.1	EA	96906		
46	M073265 WASHER NO. 4 LOCK, EXT TOOTH, CAD PL STL	28.00		ANSI B18.21.1	EA	80204		
50	M072350 SCREW 6-32 X 1/4 PAN HD,SST	8.00		PER MS51957-26	EA	96906		
51	M072350 SCREW 6-32 X 1/4 PAN HD,SST	8.00		PER MS51957-26	EA	96906		
52	M072358 SCREW 6-32 X 3/8 F HD,82 DEG,SST	12.00		PER MS51959-28	EA	96906		
55	M083264 WASHER-NO. 6- .156 .375 .049 CAD PL STL	16.00		ANSI B18.22.1	EA	96906		
56	M073269 WASHER NO. 6 LOCK, EXT TOOTH, CAD PL STL	16.00		ANSI B18.21.1	EA	80204		
70	M072430 SCREW 10-32 X 3/4 F HD,82 DEG,SST	8.00		PER MS51960-67	EA	96906		

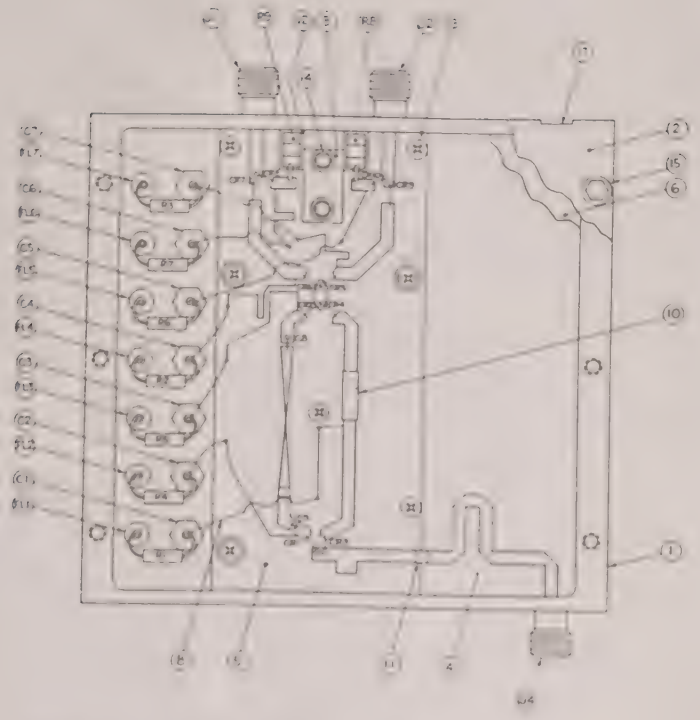
Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 7 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
71	M072430 SCREW 10-32 X 3/4 F HD,82 DEG,SST	12.00		PER MS51960-67	EA	96906		
75	M079145 WASHER-NO.10- .219 .500 .049 CAD PL STL	12.00		ANSI B18.22.1	EA	80204		
76	M075941 WASHER NO. 10 LOCK, EXT TOOTH, CAD PLT	12.00		ANSI B18.21.1	EA	80204		
80	M072321 SCREW 4-40 X 3/8 F HD,82 DEG,SST	4.00		PER MS51959-15	EA	96906		
81	M072493 SCREW 1/4-20 X 3/4 CAP,HEX HD,CAD PLT	24.00		PER MS90725-6	EA	96906		
82	M072496 SCREW 1/4-20 X 7/8 CAP,HEX HD,CAD PLT	36.00		PER MS90725-7	EA	96906		
83	M072498 SCREW 1/4-20 X 1.0 CAP,HEX HD,CAD PLT	8.00		PER MS90725-8	EA	96906		
84	M072510 SCREW 1/4-20 X 2 IN. CAP,HEX HD,CAD PLT	8.00		PER MS90725-14	EA	96906		
85	M073278 WASHER-NO1/4- .281 .625 .065 CAD PL STL	104.00		PER SA SPEC 681010	EA	80204		
86	M073277 WASHER 1/4 LOCK,SPLIT,CAD PLT STL	86.00		ANSI B18.21.1	EA	80204		
87	M071508 NUT 1/4-20 UNC-2B HEX HI-STR CAD PLT	18.00		PER MS51967-2	EA	96906		
88	M072501 SCREW 1/4-20 X 1 1/4 CAP,HEX HD,CAD PLT	10.00		PER SA SPEC 8-1002	EA	96906		
90	M419778-95 SCREW,CAD PLATED(ALTERED ITEM DWG)	16.00		PER SA DWG 419778-95	EA	10110	419778-95	
95	M419779-11 WASHER,CAD PLATED (ALTERED ITEM DRAWING)	16.00		PER SA DWG 419779-11	EA	10110	419779-11	
101	M413893 CONN CONTACT #14-20 AWG MALE BRASS/TIN	6.00	VEN938953	350218-1	EA	00779	413893	
102	M413894 CONN CONTACT #14-20 AWG FEM BRASS/TIN	6.00	VEN938953	350536-1	EA	00779	413894	

Figure 6-6. Feed Assembly, S-Band TT&C, SK446535-P2 [A2A4A2]
(Sheet 8 of 8)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV	ECN
103	M250188 PLATE-SIZE 22 CONNECTOR	1.00		PER SA DWG 250188	EA	10110	250188		
104	M240762 GASKET-NO 22 MS CONNECTOR	1.00		PER SA DWG 240762	EA	10110	240762		

*** E N D O F R E P O R T ***



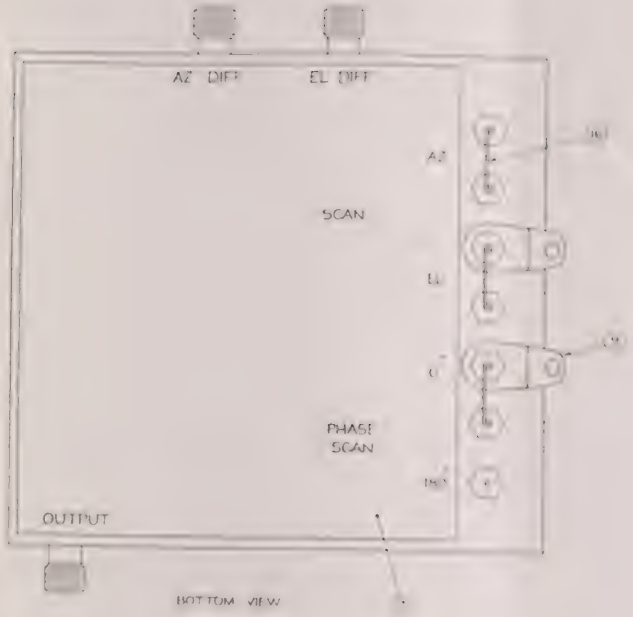


Figure 6-7. Monoscan Converter Model 251-2B, 198409E [A2A4A2A4] (Sheet 1 of 5)

Figure 6-7. Monoscan Converter Model 251-2B, 198409E [A2A4A2A4]
(Sheet 2 of 5)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
CR1	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR2	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR3	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR4	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR5	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR6	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR7	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR8	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR9	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
CR10	M198917 DIODE- SWITCHING, MONOSCAN CONVERTER	1.00		DP20054A-002	EA	10110	198917	
C1	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C2	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C3	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C4	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C5	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C6	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		

Figure 6-7. Monoscan Converter Model 251-2B, 198409E [A2A4A2A4]
(Sheet 3 of 5)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
C7	M089785 CAPACITR .001 MF 200V CER STAND-OFF 8-32	1.00	VEN228428	54-762-001-102Z	EA	10110		
C8	M085329 CAPACITR CHIP 40 PF 100V GOLD TERM	1.00	VEN483752	GC-84040-00	EA	46384		
C9	M085329 CAPACITR CHIP 40 PF 100V GOLD TERM	1.00	VEN483752	GC-84040-00	EA	46384		
FL1	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL2	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL3	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL4	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL5	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL6	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
FL7	M088146 FILTER EMT FEED THRU 100V-15A-8-32 MT	1.00	VEN938953	859618-1	EA	00779		
J1	M086782 CONN COAX SMA FEM TO TAB 2 HOLE FLNG MT	1.00	VEN313215	OSM 244-3CC	EA	82389		
J2	M086782 CONN COAX SMA FEM TO TAB 2 HOLE FLNG MT	1.00	VEN313215	OSM 244-3CC	EA	82389		
J4	M086782 CONN COAX SMA FEM TO TAB 2 HOLE FLNG MT	1.00	VEN313215	OSM 244-3CC	EA	82389		
REF	M198918 ENGINEERING BULLITEN- MONOSCAN CONVERTER			INSTRUCTNS FOR 19840	EA	10110	198918	
REF	M198928 MONOSCAN CONVERTER- MDL 344-2 SCHEMATIC				EA	10110	198928	
REF	M198929 OUTLINE- MONOSCAN CONVERTER MDL 344-2				EA	10110	198929	

Figure 6-7. Monoscan Converter Model 251-2B, 198409E [A2A4A2A4]
(Sheet 4 of 5)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
R1	M071836 RESISTOR 10 OHM 1/4W 10% COMP	1.00	VEN188136	RCR07G100KS	EA	01121		
R2	M071836 RESISTOR 10 OHM 1/4W 10% COMP	1.00	VEN188136	RCR07G100KS	EA	01121		
R3	M071836 RESISTOR 10 OHM 1/4W 10% COMP	1.00	VEN188136	RCR07G100KS	EA	01121		
R4	M081991 RESISTOR 20 OHM 1/4W 5% COMP	1.00	VEN188136	RCR07G200JS	EA	01121		
R5	M081991 RESISTOR 20 OHM 1/4W 5% COMP	1.00	VEN188136	RCR07G200JS	EA	01121		
R6	M081991 RESISTOR 20 OHM 1/4W 5% COMP	1.00	VEN188136	RCR07G200JS	EA	01121		
R7	M081991 RESISTOR 20 OHM 1/4W 5% COMP	1.00	VEN188136	RCR07G200JS	EA	01121		
R8	M089786 RESISTOR CHIP 50 OHM 5% 100X200 MIL	1.00	VEN079751	PPC100-200A-G-50-5	EA	10110		
R9	M089786 RESISTOR CHIP 50 OHM 5% 100X200 MIL	1.00	VEN079751	PPC100-200A-G-50-5	EA	10110		
1	M195394 PLATE- LOWER, MONOSCAN CONVERTER	1.00		PER SA DWG 195394	EA	96906	195394	
2	M195390 PLATE- UPPER, MONOSCAN CONVERTER	1.00		PER SA DWG 195390	EA	96906	195390	
3	M197871 HEAT SINK	1.00		PER SA DWG 197871	EA	10110	197871	
4	M198909 PWB OUTPUT, MONOSCAN CONVERTER	1.00		PER SA DWG 198909	EA	10110	198909	
5	M194354 PWB- AZ-EL SWITCHING	1.00		PER SA DWG 194354	EA	10110	194354	
6	M198910 PWB- COVER BOARD	1.00		PER SA DWG 198910	EA	10110	198910	
7	M358646 LABEL MONOSCAN CONVERTER MODEL 251-2B	1.00			EA	10110	358646	

Figure 6-7. Monoscan Converter Model 251-2B, 198409E [A2A4A2A4]
(Sheet 5 of 5)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
8	M076999 WIRE .006 DIA GOLD PLTD SOLID COPPER			BY DESCRIPTION	FT	00435		
9	M088700 TERMINAL LUG SOLDER FLAT .169 MTG HOLE	2.00	VEN289962	46-.169	EA	17856		
10	M198919 ABSORBER-R.F. MONOSCAN CONVERTER	1.00		PER SA DWG 198919	EA	10110	198919	
11	M198893 RIBBON- COPPER, TINNED, .078 WIDW			PER SA DWG 198893	LB	10110	198893	
12	M198832 FOIL-COPPER TINNED			PER SA DWG 198832	FT	10110	198832	
13	M083964 SCREW 2-56 X 3/16 PAN HD, CAD PLT STL	15.00		PER MS35206-202	EA	96906		
14	M089788 SCREW 2-56 X 3/16 SOC CAP SST	2.00		PER ANSI B18.3	EA	10110		
15	M072328 SCREW 4-40 X 3/8 SOC CAP SST	9.00		PER MS16995-10	EA	96906		
16	M073318 WIRE 22 BUS			8021	FT	70903		
17	M198927 PLUG-MONSOCAN CONVERTER-MOD 344-2	1.00		PER SA DWG 198927	EA	10110	198927	

*** E N D O F R E P O R T ***

NOTES:

1. PREPARE CABLE ENDS PER SA DWG 44e3e5

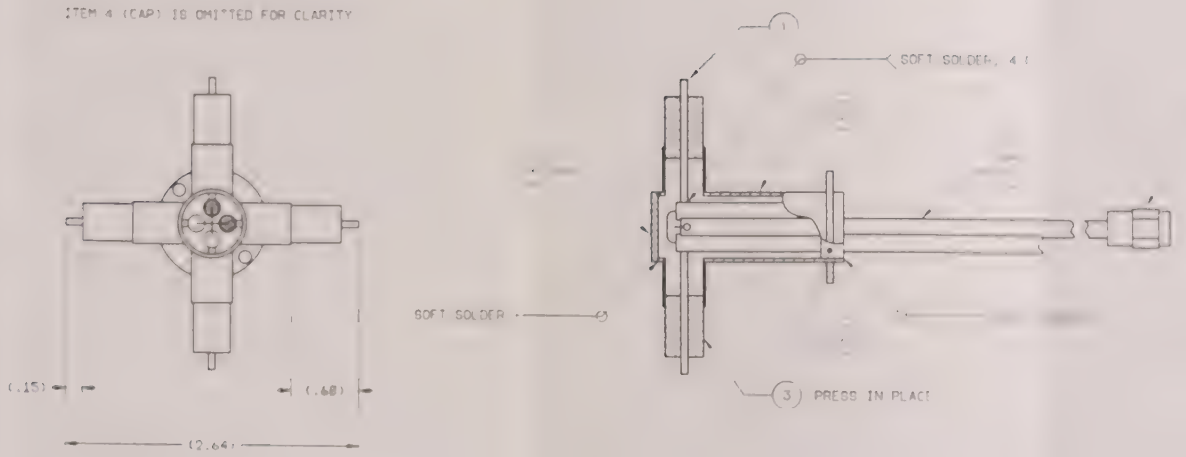


Figure 6-8. Dipole Assembly, SK445486 [A2A4A2E1 to E4] (Sheet 1 of 2)

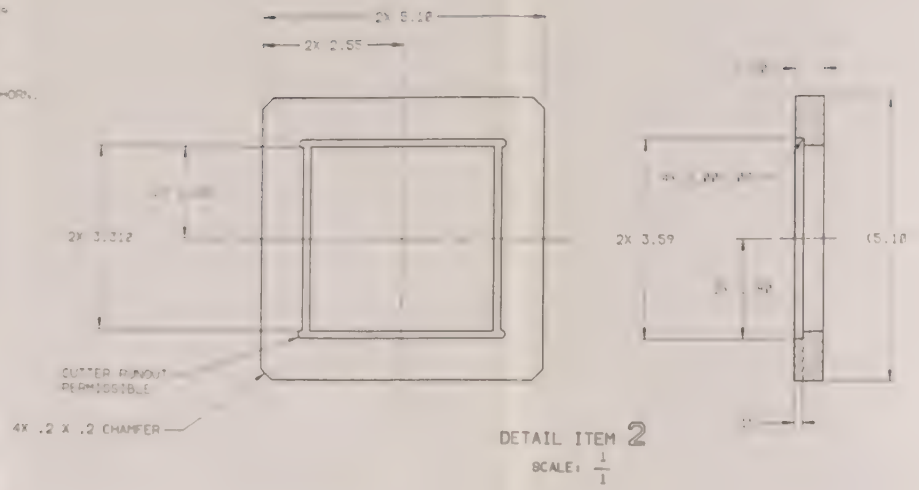
Figure 6-8. Dipole Assembly, SK445486 [A2A4A2E1 to E4]
(Sheet 2 of 2)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
REF	M446369 CABLE, COAXIAL - END PREPARATION			PER SA DWG 446369	EA	10110	446369	
1	M063092 ELEMENT, DIPOLE	4.00			EA	10110	063092	
2	M445487 HOUSING, DIPOLE	1.00		PER SA DWG 445487	EA	10110	445487	
3	M445488 BEAD, DIPOLE	4.00		PER SA DWG 445488	EA	10110	445488	
4	M045916 CAP,DIPOLE-MODEL 70B,71,72, & 73	1.00		PER SA DWG 45916	EA	10110	045916	
5	M199161 CABLE COAX SEMI-RIG .141 OD TP 50 OHMSFT	2.00	VEN474906	UT-141A TP 5FT	FT	2K497	199161	
6	M415694 SUB-ASSY BALUN MODEL 72	1.00		PER SA DWG 415694	EA	10110	415694	
7	M076916 CONN COAX SMA MALE-NO PIN- TO .141 CABLE	2.00		515-001	EA	16733		

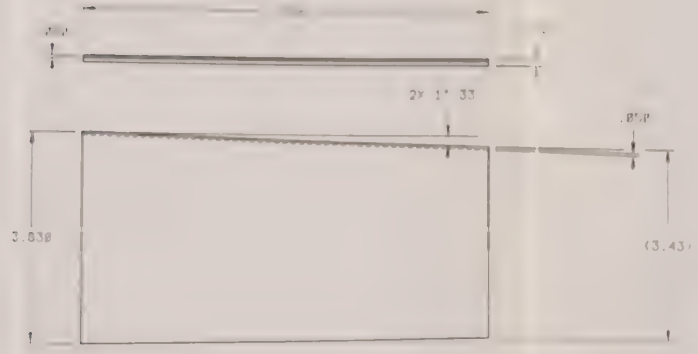
*** E N D O F R E P O R T ***

NOTES:

1. TREAT RAW MATERIAL PER SA SPEC 611878 BEFORE WELDING.
2. WELD PER SA SPEC 611878.
3. FILE OPENING TO FIT INSIDE TAPER OF HORN.



DETAIL ITEM 2
SCALE: 1/1



DETAIL ITEM 3
SCALE: 1/1

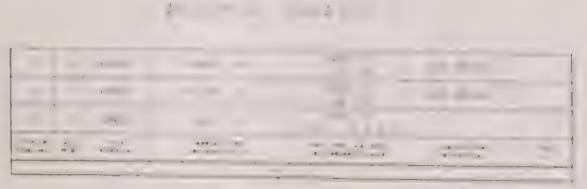


Figure 6-9. Feed Horn, SK445495-P1 [A2A4A2E5] (Sheet 1 of 3)

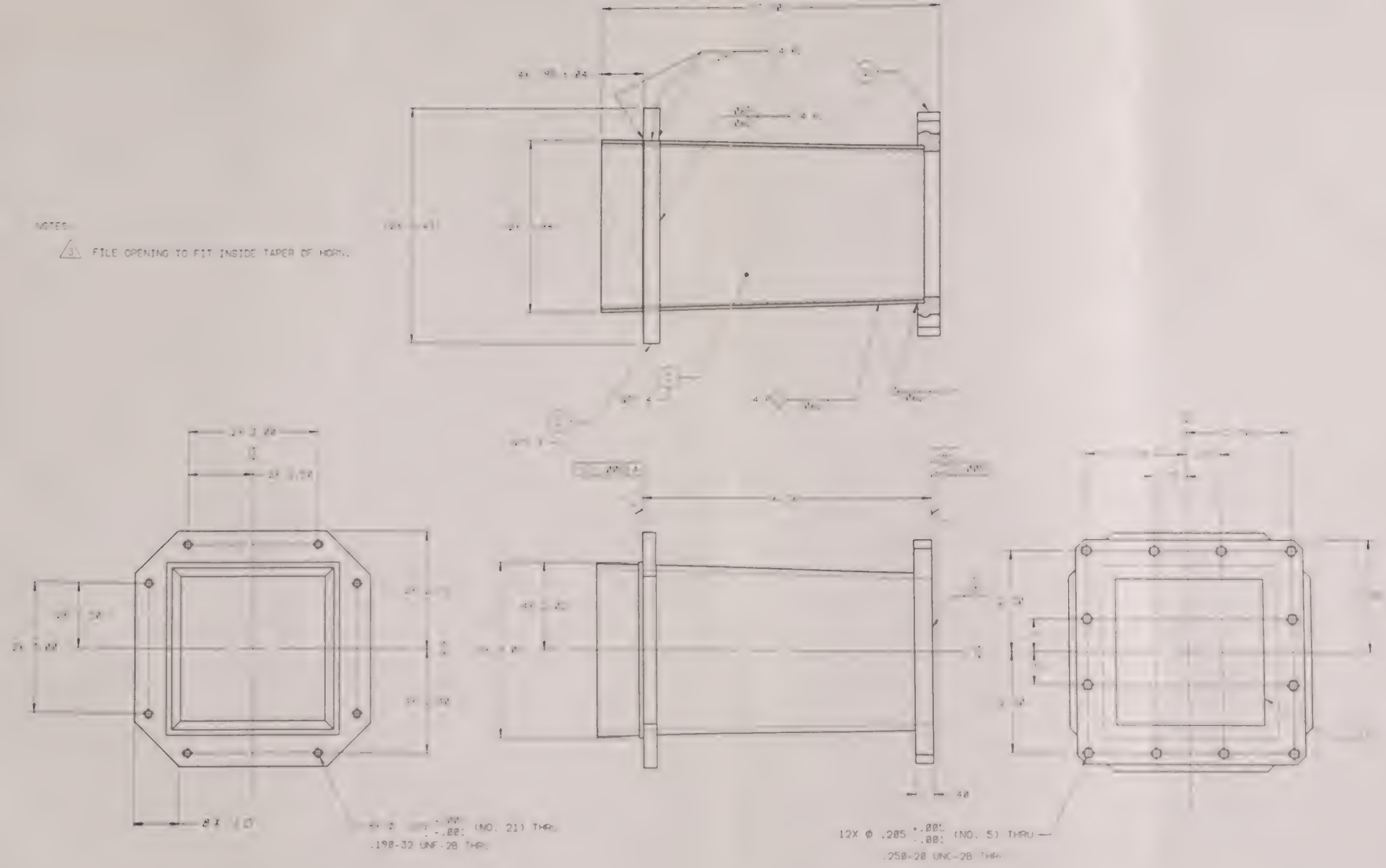


Figure 6-9. Feed Horn, SK445495-P1 [A2A4A2E5] (Sheet 2 of 3)

Figure 6-9. Feed Horn, SK445495-P1 [A2A4A2E5]
(Sheet 3 of 3)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV	ECN
1	M068017 3/8 X 3/4 6061-T6 OR T651 AL RECT BAR	1.56		CONTROL DWG 68017	LF	30161			
2	M069457 .500 THK 6061-T651 AL PLATE	.18		CONTROL DWG 69457	SF	10110			
3	M069452 .125 THK 6061-T6 AL SHT	.81		CONTROL DWG 69452	SF	10110			

*** E N D O F R E P O R T ***

NOTES:

1. LOCATE MINIMUM CLEARANCE OPENING IN PANEL TO ALLOW WAVEGUIDE PASSAGE THRU ANTENNA. LOCATE APPROX AS SHOWN.
2. LENGTH TO BE DETERMINED AT FINAL ASSEMBLY.
3. TRANSFER AT ASSEMBLY:
   Ø .158 - .164 (NO. 21) ↧ .85 MIN
   .190-32 UNF-2B ↧ .55 MIN
4. TRANSFER AT ASSEMBLY:
   Ø .374 - .381 (3/8) THRU
5. TRANSFER AT ASSEMBLY:
   Ø .260 - .267 (LTR G) ↧ 1.15 MIN
   .3125-18 UNC-2B ↧ .75 MIN
6. TRANSFER AT ASSEMBLY:
   Ø .436 - .443 (7/16) THRU
7. TRANSFER AT ASSEMBLY:
   Ø .315 - .322 (LTR O) ↧ 1.25 MIN
   .375-16 UNC-2B ↧ .75 MIN
8. CUT ITEM 18 AS REQUIRED TO ALIGN SLOT WITH BRACE.

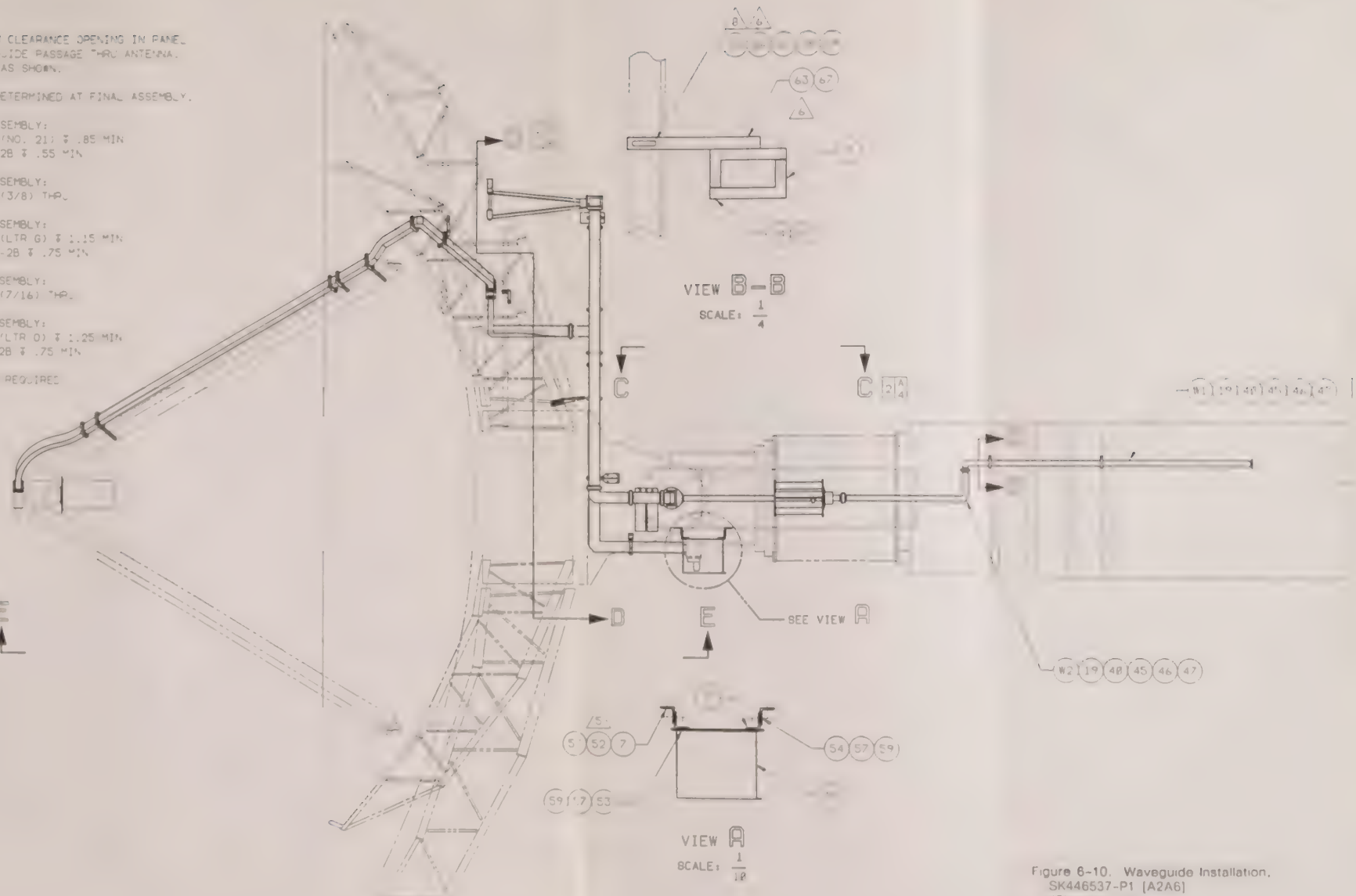


Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6] (Sheet 1 of 9)

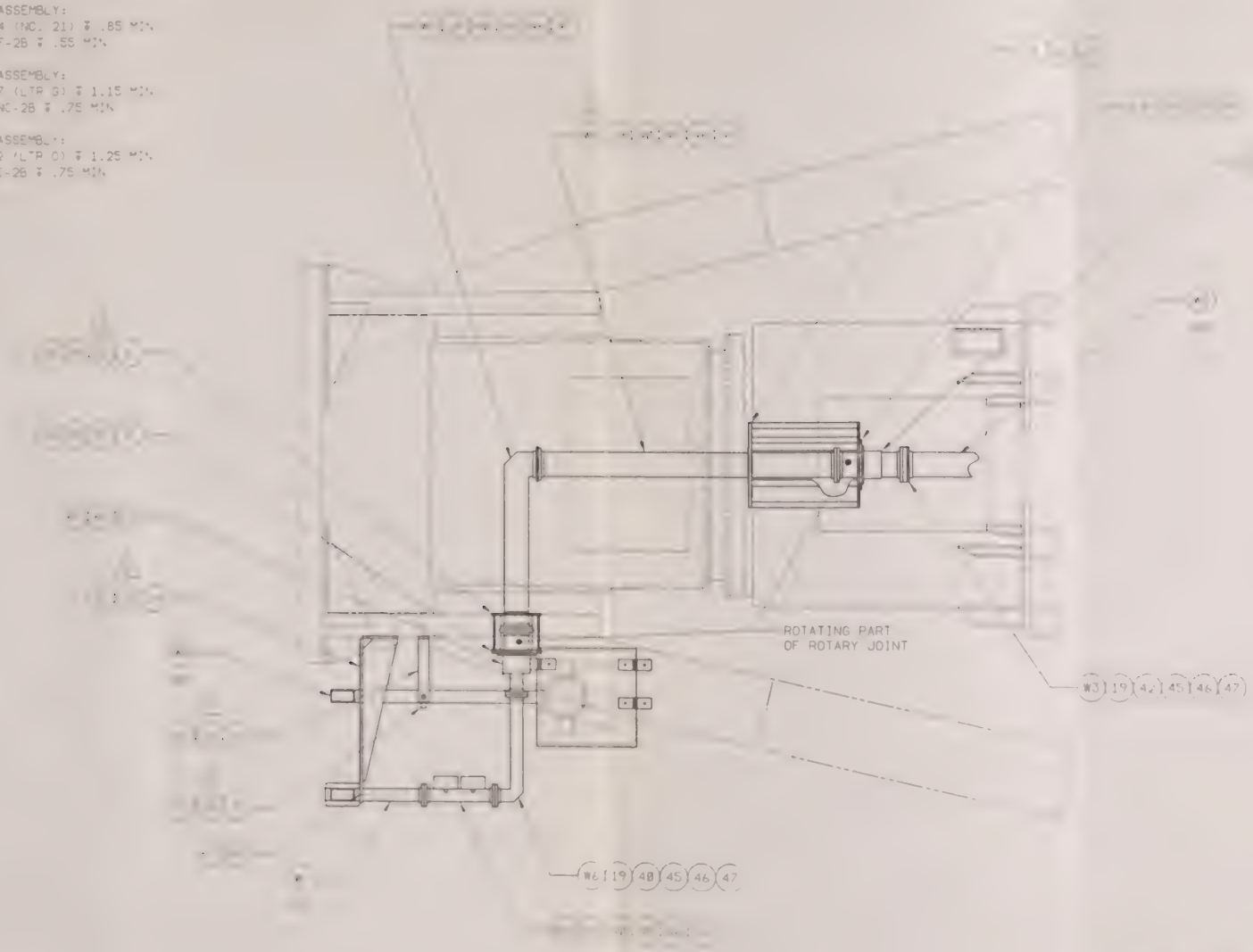
NOTES:

2. LENGTH TO BE DETERMINED AT FINAL ASSEMBLY.

3. TRANSFER AT ASSEMBLY:
Ø .158 - .164 (NO. 21) ↧ .85 MIN.
.190-32 UNF-2B ↧ .55 MIN.

5. TRANSFER AT ASSEMBLY:
Ø .260 - .267 (LTR G) ↧ 1.15 MIN.
.3125-18 UNC-2B ↧ .75 MIN.

6. TRANSFER AT ASSEMBLY:
Ø .315 - .322 (LTR O) ↧ 1.25 MIN.
.375-16 UNC-2B ↧ .75 MIN.



VIEW C-C
SCALE: 1/10

Figure 6-10. Waveguide Installation.
SK446537-P1 [A2A6]
(Sheet 2 of 9)

NOTES:

4 TRANSFER AT ASSEMBLY:
Ø .374 - .381 (3/8) THRU

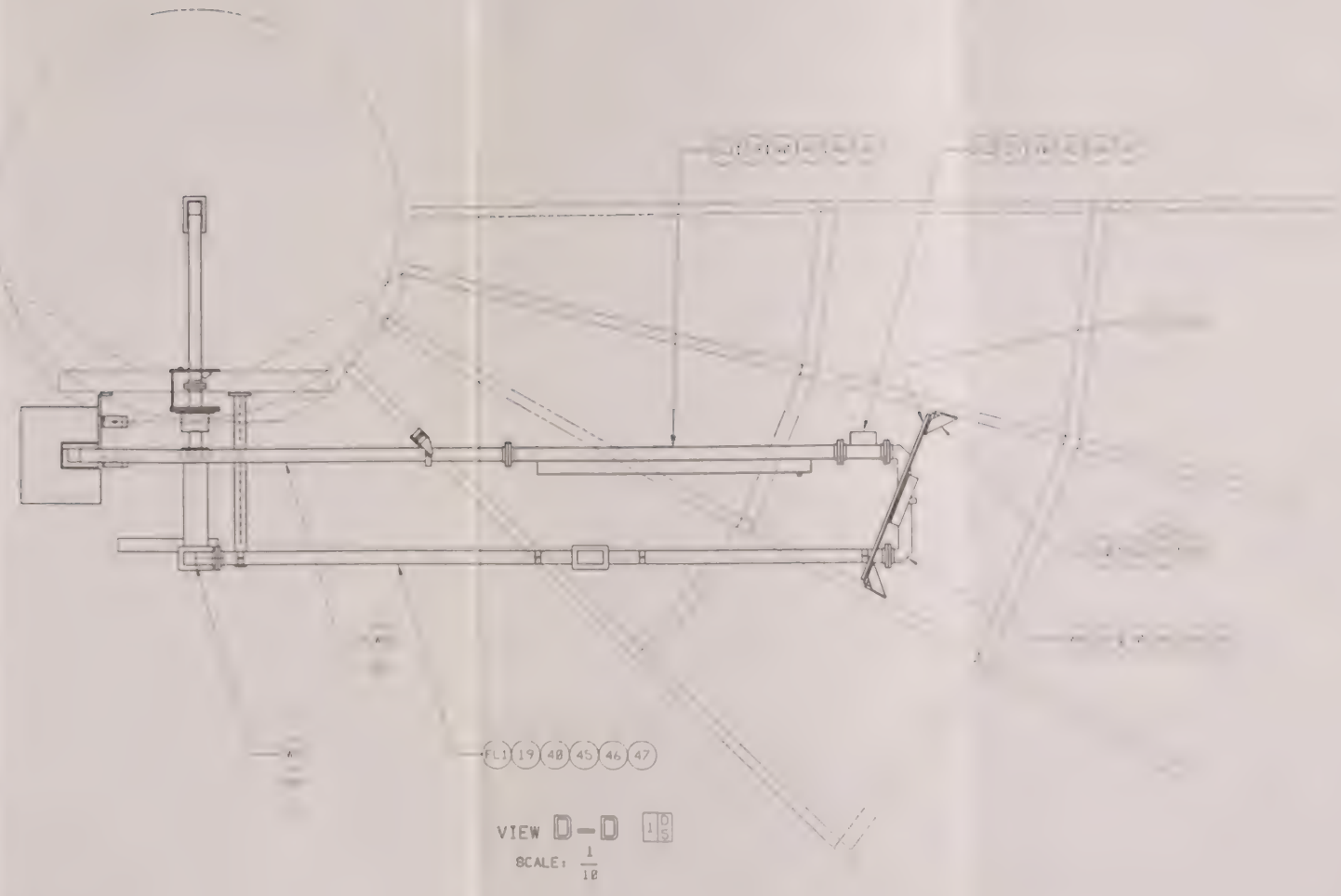


Figure 6-10. Waveguide Installation, SK446537-P1 (A2A6) (Sheet 3 of 9)

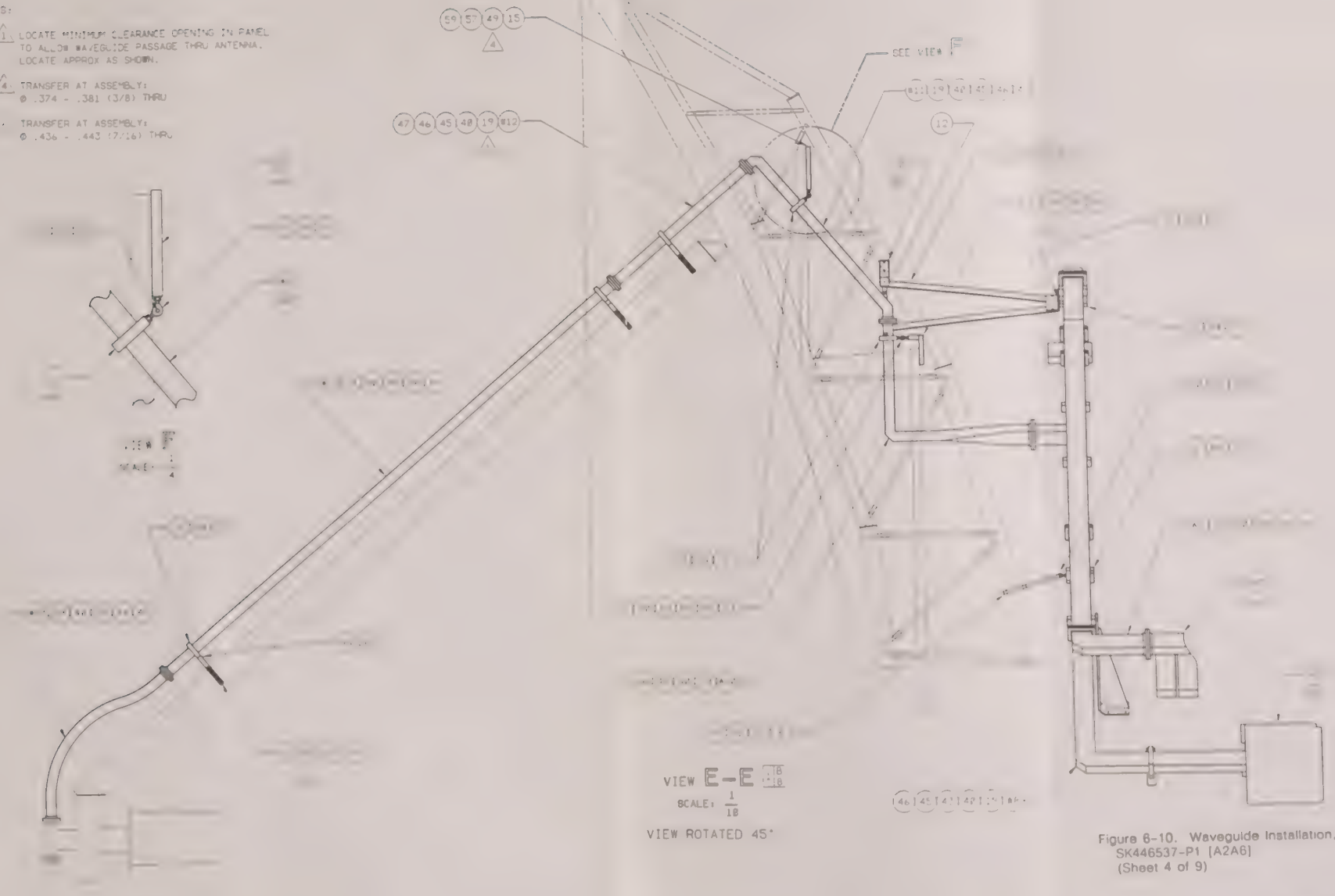

NOTES:
1. LOCATE MINIMUM CLEARANCE OPENING IN PANEL TO ALLOW WAVEGUIDE PASSAGE THRU ANTENNA. LOCATE APPROX AS SHOWN.
4. TRANSFER AT ASSEMBLY: Ø .374 - .381 (3/8) THRU
TRANSFER AT ASSEMBLY: Ø .436 - .443 (7/16) THRU
SEE VIEW F
VIEW E-E
SCALE: 1/18
VIEW ROTATED 45°

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6] (Sheet 4 of 9)

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6]
(Sheet 5 of 9)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
A5	M446539 LNA ASSEMBLY, S-BAND TT & C	1.00		PER SA DWG 446539	EA	10110	446539	
DC1	M445066 COUPLER,BROADWALL,WR430,10DB,TYPE N SERIES 40	1.00	VEN367543	1140226	EA			
DC2	M445068 COUPLER,CROSSGUIDE,WR430,40DB,TYPE N	1.00	VEN367543	1140224	EA			
DC3	M445067 COUPLER,BROADWALL,DUAL-ARM,WR430,30DB SERIES 44	1.00	VEN367543	1140225	EA			
E1	M445796 SPEC,ROTARY JOINT,SINGLE CHL WR430,2025-2120MHZ,I	1.00		PER SA DWG 445796	EA	10110	445796	
E2	M445796 SPEC,ROTARY JOINT,SINGLE CHL WR430,2025-2120MHZ,I	1.00		PER SA DWG 445796	EA	10110	445796	
FL1	M445873 S-BAND WAVEGUIDE DIPLEXER	1.00		PER SA DWG 445873	EA	10110	445873	
W1	M446697 WAVEGUIDE, BASE EXTENSION	1.00		PER SA DWG 446697	EA	10110	446697	
W2	M446695 WAVEGUIDE, LOWER AZ TO BASE EXTENSION	1.00		PER SA DWG 446695	EA	10110	446695	
W3	M446140 PRESSURE BLOCK, GROOVED, WR430	1.00		PER SA DWG 446140	RE	10110	446140	
W4	M446694 WAVEGUIDE, UPPER AZ TO EL	1.00		PER SA DWG 446694	EA	10110	446694	
W5	M446696 WAVEGUIDE, AZ AXIS TO EL RJ	1.00		PER SA DWG 446696	EA	10110	446696	
W6	M446698 WAVEGUIDE, EL RJ TO COUPLER	1.00		PER SA DWG 446698	EA	10110	446698	
W7	M446699 WAVEGUIDE, COUPLER TO DIPLEXER	1.00		PER SA DWG 446699	EA	10110	446699	
W8	M446700 WAVEGUIDE, LNA TO COUPLER	1.00		PER SA DWG 446700	EA	10110	446700	
W9	M446701 WAVEGUIDE, DIPLEXER TO COUPLER	1.00		PER SA DWG 446701	EA	10110	446701	

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6]
(Sheet 6 of 9)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
W10	M446702 WAVEGUIDE, DIPLEXER TO DISH	1.00		PER SA DWG 446702	EA	10110	446702	
W11	M446703 WAVEGUIDE, LOWER DISH	1.00		PER SA DWG 446703	EA	10110	446703	
W12	M446704 WAVEGUIDE, INNER DISH, OFFSET	1.00		PER SA DWG 446704	EA	10110	446704	
W13	M446705 WAVEGUIDE, SPAR	1.00		PER SA DWG 446705	EA	10110	446705	
W14	M446706 FLEXGUIDE, PREFORMED, FEED TO FLEXGUIDE	1.00		PER SA DWG 446706	EA	10110	446706	
1	M424721 CLAMP,WAVEGUIDE,WR430	6.00			EA	4P102	424721	
2	M445581 MOUNT, WAVEGUIDE TO SPAR	3.00		PER SA DWG 445581	EA	10110	445581	
3	M445582 CLAMP, WR430 WAVEGUIDE 3/8-16 THREADS	14.00		PER SA DWG 445582	EA	10110	445582	
4	M446687 ADAPTER, RJ TO MOUNT	2.00		PER SA DWG 446687	EA	10110	446687	
5	M446688 MOUNT, AZ RJ	1.00		PER SA DWG 446688	EA	10110	446688	
6	M446689 MOUNT, EL RJ	1.00		PER SA DWG 446689	EA	10110	446689	
7	M446691 MOUNT, LNA	6.00		PER SA DWG 446691	EA	10110	446691	
8	M446820 CLAMP, WAVEGUIDE MOUNT TO TRUSS	1.00		PER SA DWG 446820	EA	10110	446820	
9	M446822 MOUNT, WAVEGUIDE, NO. 1	1.00		PER SA DWG 446822	EA	10110	446822	
10	M446823 MOUNT, WAVEGUIDE, NO. 2	2.00		PER SA DWG 446823	EA	10110	446823	
11	M446824 MOUNT, WAVEGUIDE, NO. 3	2.00		PER SA DWG 446824	EA	10110	446824	

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6]
(Sheet 7 of 9)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
12	M446825 MOUNT, WAVEGUIDE, NO. 4	1.00		PER SA DWG 446825	EA	10110	446825	
13	M446826 MOUNT, WAVEGUIDE, NO. 5	1.00		PER SA DWG 446826	EA	10110	446826	
14	M446827 MOUNT, WAVEGUIDE, NO. 6	1.00		PER SA DWG 446827	EA	10110	446827	
15	M446828 MOUNT, WAVEGUIDE TO TRUSS, NO. 1	1.00		PER SA DWG 446828	EA	10110	446828	
16	M446829 MOUNT, WAVEGUIDE TO TRUSS, NO. 2	1.00		PER SA DWG 446829	EA	10110	446829	
17	M446830 MOUNT, WAVEGUIDE TO TRUSS, NO. 3	1.00		PER SA DWG 446830	EA	10110	446830	
18	M446872 WAVEGUIDE MOUNT NO. 7	2.00		PER SA DWG 446872	EA	10110	446872	
19	M416388 GASKET,WAVEGUIDE,WR430, PER MIL-F-3922/52 STYLE I	21.00		106	EA	25531	416388	
30	M072465 SCREW 10-24 X 7/8 TRIM HEX HD CAD PLT	6.00		PER ANSI B18.6.3	EA	80204		
31	M193199 SCREW 10-32 X 7/8 PAN HD,SST	12.00		MS51958-66	EA	96906	193199	
35	M079145 WASHER-NO.10- .219 .500 .049 CAD PL STL	18.00		ANSI B18.22.1	EA	80204		
36	M075941 WASHER NO. 10 LOCK, EXT TOOTH, CAD PLT	18.00		ANSI B18.21.1	EA	80204		
40	M072504 SCREW 1/4-20 X 1 1/2 CAP,HEX HD,CAD PLT	170.00		PER MS90725-12	EA	96906		
41	M072513 SCREW 1/4-20 X 2 1/4 CAP,HEX HD,CAD PLT	10.00		PER MS90725-15	EA	96906		
42	M072515 SCREW 1/4-20 X 2 1/2 CAP,HEX HD, CAD PLT	10.00		PER MS90725-16	EA	96906		
43	M072496 SCREW 1/4-20 X 7/8 CAP,HEX HD,CAD PLT	10.00		PER MS90725-7	EA	96906		

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6]
(Sheet 8 of 9)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
45	M073278 WASHER-NO1/4- .281 .625 .065 CAD PL STL	380.00		PER SA SPEC 681010	EA	80204		
46	M073277 WASHER 1/4 LOCK,SPLIT,CAD PLT STL	180.00		ANSI B18.21.1	EA	80204		
47	M071508 NUT 1/4-20 UNC-2B HEX HI-STR CAD PLT	180.00		PER MS51967-2	EA	96906		
49	M072550 SCREW 5/16-18 X 2 IN. CAP,HEX HD,CAD PLT	2.00		PER MS90725-40	EA	96906		
50	M077997 SCREW SHLDR 3/8 X 1/2 5/16-18 X 1/2 STL	1.00		MS51975-16	EA	96906		
51	M073534 SCREW SHLDR 3/8 X 1.0,5/16-18 X 1/8 SST	2.00		BY DESCRIPTION 303SS	EA	10110		
52	M072541 SCREW 5/16-18 X 1.0 CAP,HEX HD,CAD PLT	9.00		PER MS90725-34	EA	96906		
53	M072543 SCREW 5/16-18 X 1 1/4 CAP,HEX HD,CAD PLT	3.00		PER MS90725-36	EA	96906		
54	M072545 SCREW 5/16-18 X 1 1/2 CAP,HEX HD,CAD PLT	23.00		PER MS90725-38	EA	96906		
55	M072548 SCREW 5/16-18 X 1 3/4 CAP,HEX HD,CAD PLT	8.00		PER MS90725-39	EA	96906		
56	M072556 SCREW 5/16-18 X 2 3/4 CAP,HEX HD,CAD PLT	4.00		PER MS90725-43	EA	96906		
57	M073280 WASHER- 5/16- .344 .688 .065 CAD PL STL	65.00		PER SA SPEC 681010	EA	96906		
59	M071511 NUT 5/16-18 UNC-2B HEX HI-STR CAD PLT	22.00		PER MS51967-5	EA	96906		
60	M075829 SCREW 3/8-16 X 1 1/2 CAP,HEX HD,CAD PLT	3.00		PER MS90725-64	EA	96906		
61	M072579 SCREW 3/8-16 X 1.0 CAP,HEX HD,CAD PLT	3.00		PER MS90725-60	EA	96906		
62	M072584 SCREW 3/8-16 X 1 1/4 CAP,HEX HD,CAD PLT	15.00		PER MS90725-62	EA	96906		

Figure 6-10. Waveguide Installation, SK446537-P1 [A2A6]
(Sheet 9 of 9)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
63	M072589 SCREW 3/8-16 X 1 3/4 CAP,HEX HD,CAD PLT	2.00		PER MS90725-65	EA	96906		
64	M072595 SCREW 3/8-16 X 2 1/2 CAP,HEX HD,CAD PLT	2.00		PER MS90725-68	EA	96906		
65	M446934 STUD, MTG, 9.0 LG	6.00		PER SA DWG 446934	EA	10110	446934	
67	M073282 WASHER- 3/8- .406 .812 .065 CAD PL STL	42.00		PER SA SPEC 681010	EA	80204		
68	M076437 WASHER 3/8 TAPERED CAD PLT STL	2.00		BY DESCRIPTION	EA	72228		
69	M071513 NUT 3/8 - 16 UNC-2B GRADE 5 STL CAD PL	14.00		PER MS51967-8	EA	96906		
70	M071514 NUT 3/8-24 UNF-2B HEX HI-STR CAD PLT	5.00		PER MS51968-8	EA	96906		
71	M173884 BEARING ROD END 3/8 BORE 3/8-24 THD	5.00		TRE-6	EA	10110	173884	

*** E N D O F R E P O R T ***

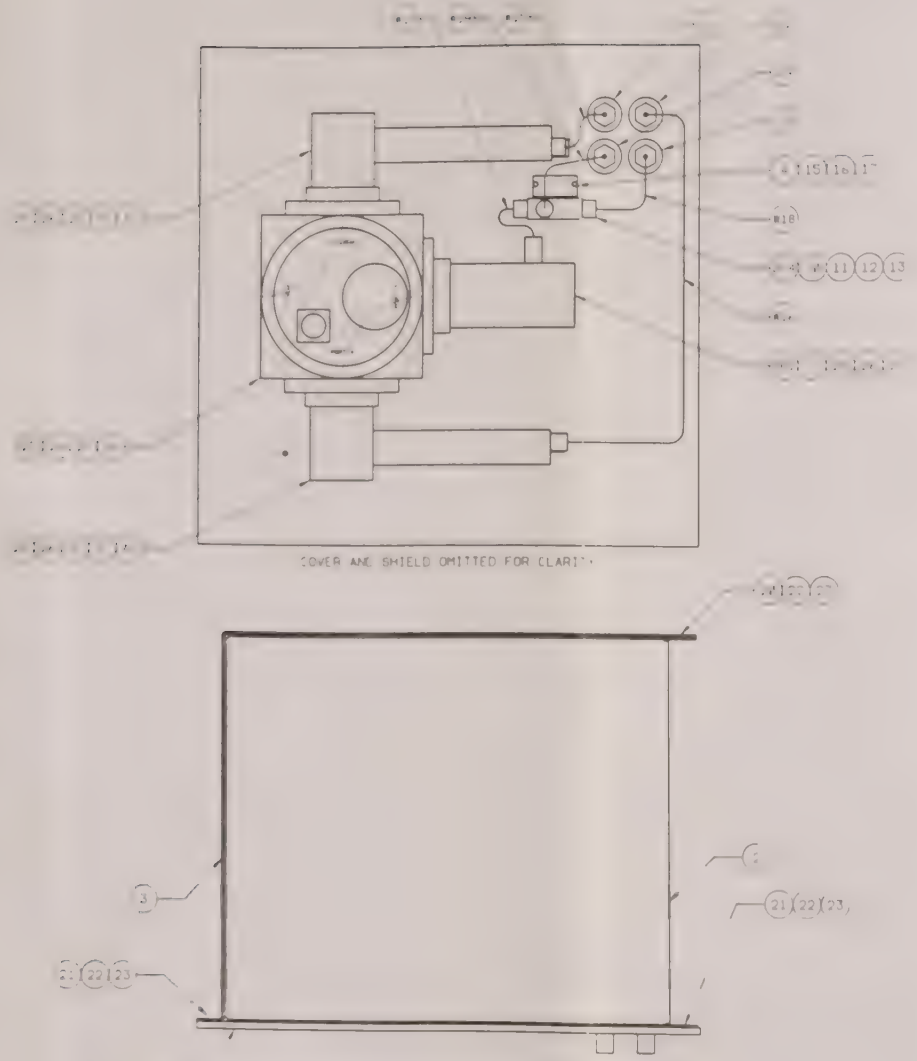


Figure 6-11. LNA Assembly, S-Band TT&C, SK446539-P1 [A2A5] (Sheet 1 of 4)

Figure 6-11. LNA Assembly, S-Band TT&C, SK446539-P1 [A2A5]
(Sheet 2 of 4)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
A1	M445877 LOW NOISE AMPIFIER,S-BAND PROCURMENT SPECIFICATION	1.00		PER SA DWG 445877	EA	10110	445877	
A2	M445877 LOW NOISE AMPIFIER,S-BAND PROCURMENT SPECIFICATION	1.00		PER SA DWG 445877	EA	10110	445877	
CP1	M445065 ADAPTER,COAX-TO-WAVEGUIDE,WR430,TYPE N	1.00	VEN367543	1120085	EA			
DC4	M445027 COUPLER DIRECTIONAL,20DB,2-4 GHZ,TYPE N	1.00	VEN001722	N4164-20	EA			
J1	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
J2	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
J3	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
J4	M420958 CONN COAX N JACK TO SMA JACK SST	1.00		050-675-0899-89	EA	98291	420958	
S1	M444737 SWITCH, WAVEGUIDE, WR430, AUTOSAFE, 28V/3 AMP	1.00	VEN343018	SM4AM-707	EA	53263		
W15	M433205 CABLE TYPE N MALE TO SMA MALE 4.5 IN.	4.50		PER SA DWG 433205	EA	10110	433205	
W16	M433232 CABLE TYPE N MALE TO SMA MALE 18.0 IN.	18.00		PER SA DWG 433232	EA	10110	433232	
W17	M432610 CABLE,.141 COAX TYPE N MALE TO N MALE 7.0	7.00		PER SA DWG 432610	EA	10110	432610	
W18	M433210 CABLE TYPE N MALE TO SMA MALE 7.0 IN.	7.00		PER SA DWG 433210	EA	10110	433210	
W19	M433212 CABLE TYPE N MALE TO SMA MALE 8.0 IN.	8.00		PER SA DWG 433212	EA	10110	433212	
1	M446692 MOUNTING, PLATE, LNA	1.00		PER SA DWG 446692	EA	10110	446692	
2	M446693 SHIELD, LNA	1.00		PER SA DWG 446693	EA	10110	446693	

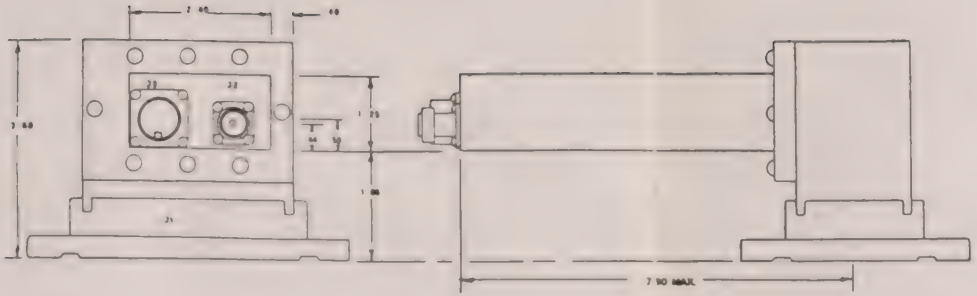
Figure 6-11. LNA Assembly, S-Band TT&C, SK446539-P1 [A2A5]
(Sheet 3 of 4)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	R E V	ECN
3	M446690 COVER, LNA	1.00		PER SA DWG 446690	EA	10110	446690		
4	M446782 MOUNT, CPLR	1.00		PER SA DWG 446782	EA	10110	446782		
7	M416388 GASKET,WAVEGUIDE,WR430, PER MIL-F-3922/52 STYLE I	3.00		106	EA	25531	416388		
10	M084419 SCREW 2-56 X 1 IN. PAN HD, CAD PLT STL	4.00		PER MS35206-321	EA	14752			
11	M083966 WASHER-NO. 2- .094 .250 .020 CAD PL STL	8.00		ANSI B18.22.1	EA	80204			
12	M073263 WASHER NO. 2 LOCK, EXT TOOTH, CAD PL STL	8.00		ANSI B18.21.1	EA	80204			
13	M083987 NUT 2-56 PLAIN-HEX, CAD PLT STL	4.00		PER MS35649-222	EA	04713			
15	M083445 SCREW 6-32 X 1/2 PAN HD, CAD PLT STL	2.00		PER MS35206-230	EA	96906			
16	M083264 WASHER-NO. 6- .156 .375 .049 CAD PL STL	2.00		ANSI B18.22.1	EA	96906			
17	M073269 WASHER NO. 6 LOCK, EXT TOOTH, CAD PL STL	2.00		ANSI B18.21.1	EA	80204			
20	M083450 SCREW 10-32 X 3/8 PAN HD, CAD PLT STL	9.00		PER MS35207-261	EA	96906			
21	M083475 SCREW 10-32 X 1/2, TRUSS HD, CAD PLT STL	13.00		PER ANSI B18.6.3	EA	75382			
22	M079145 WASHER-NO.10- .219 .500 .049 CAD PL STL	22.00		ANSI B18.22.1	EA	80204			
23	M075941 WASHER NO. 10 LOCK, EXT TOOTH, CAD PLT	22.00		ANSI B18.21.1	EA	80204			
25	M072493 SCREW 1/4-20 X 3/4 CAP,HEX HD,CAD PLT	16.00		PER MS90725-6	EA	96906			
26	M073276 WASHER-NO.10- .219 .500 .049 CAD PL STL	16.00		ANSI B18.22.1	EA	80804			

Figure 6-11. LNA Assembly, S-Band TT&C, SK446539-P1 [A2A5]
(Sheet 4 of 4)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	R E V	ECN
27	M073277 WASHER 1/4 LOCK,SPLIT,CAD PLT STL	16.00		ANSI B18.21.1	EA	80204			

*** E N D O F R E P O R T ***



J3	FUNCTION
A	DC RET
B	SAFETY GND
C	+15 VDC
D	STATUS RET
E	STATUS N.O
F	STATUS N.C

CLOSURE	CONDITION
PIN D-F	FAULT
PIN D-E	NORMAL

CONN	FUNCTION	TYPE
J1	RF INPUT	FLANGE CPR430G per EIA-RS-271-A
J2	RF OUTPUT	TYPE N Female
J3	POWER/ STATUS	MS3112E10-6P (MS3116F10-6S Mate)

Figure 6-12. Low Noise Amplifier, SK445877-P2 [A2A5A1, A2A5A2]

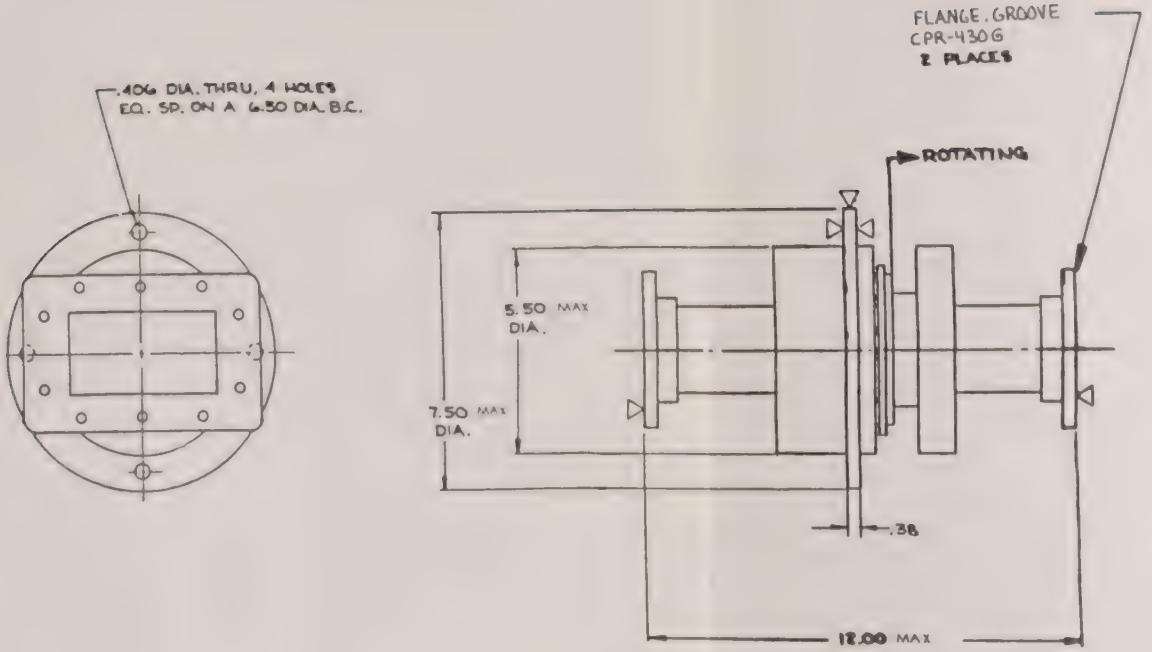


Figure 6-13. Rotary Joint, Single Channel, SK445796-P3 [A2A6A1, A2A6A2]

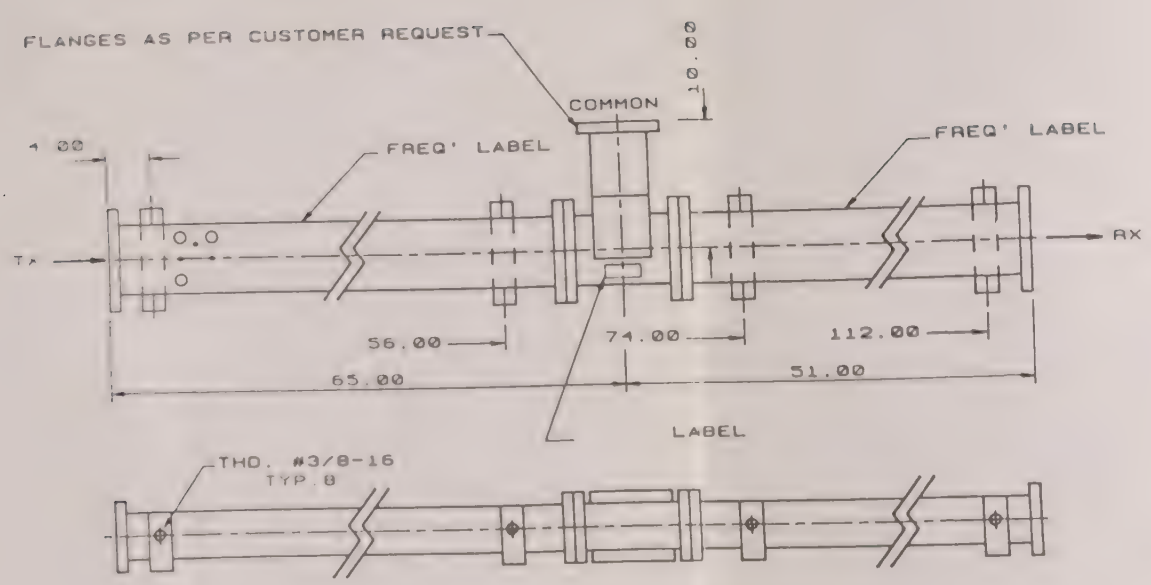


Figure 6-14. S-Band Waveguide Diplexer, SK445873-P1 [A2A6A3]

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. INTERPRET DRAWING PER DOD-STD-100.
2. IDENTIFICATION MARKING PER MIL-STD-130.
3. NOMENCLATURE TO BE PERMANENTLY STAMPED PER 622614 USING THE INFORMATION SUPPLIED ON SYSTEM CABLE DIAGRAM AND MARKER INSTALLED IN APPROXIMATE LOCATION SHOWN.
4. CONTINUITY TEST TO BE CONDUCTED ON FINISHED CABLE.
5. ASSEMBLE PER SCIENTIFIC ATLANTA STANDARDS 671089.

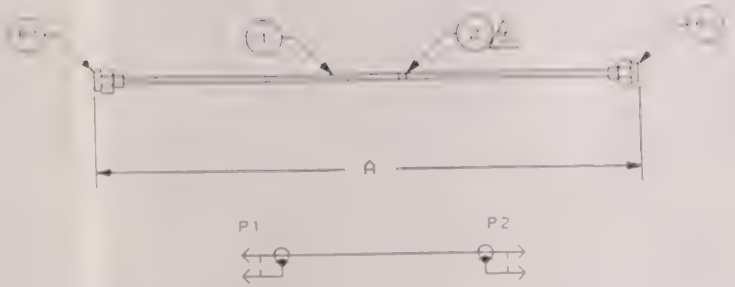


Figure 6-15. Cable Assembly, 352149, Coaxial Part No
432112, 8 Inch [A2A4A2W11, A2A4A2W12];
432110, 7 Inch [A2A4A2W13, A2A4A2W14, A2A4A2W17];
432114, 9 Inch [A2A4A2W15];
432116, 10 Inch [A2A4A2W16]
(Sheet 1 of 2)

Figure 6-15. Cable Assembly, 352149, Coaxial Part No.: 432112, 8 Inch [A2A4A2W11, A2A4A2W12]; 432110, 7 Inch [A2A4A2W13, A2A4A2W14, A2A4A2W17]; 432114, 9 Inch [A2A4A2W15]; 432116, 10 Inch [A2A4A2W16] (Sheet 2 of 2)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV	ECN
P1	M076916 CONN COAX SMA MALE-NO PIN- TO .141 CABLE	1.00		515-001	EA	16733			
P2	M076916 CONN COAX SMA MALE-NO PIN- TO .141 CABLE	1.00		515-001	EA	16733			
1	M199161 CABLE COAX SEMI-RIG .141 OD TP 50 OHM5FT		VEN474906	UT-141A TP 5FT	FT	2K497	199161		
2	M199195 CABLE TIE 6.75LG BLACK	1.00		SSM2S-DO	EA	00779	199195		

*** E N D O F R E P O R T ***

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. INTERPRET DRAWING PER DOD-STD-100.
2. IDENTIFICATION MARKING PER MIL-STD-130.
3. NOMENCLATURE TO BE PERMANENTLY STAMPED PER 622614 USING THE INFORMATION SUPPLIED ON SYSTEM CABLE DIAGRAM AND MARKER INSTALLED IN APPROXIMATE LOCATION SHOWN.
4. CONTINUITY TEST TO BE CONDUCTED ON FINISHED CABLE.
5. ASSEMBLE PER SCIENTIFIC ATLANTA STANDARDS 671809.

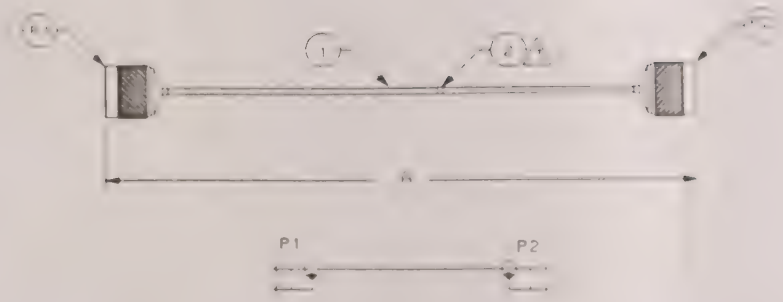


Figure 6-16. Cable Assembly, 352146, 7 Inch, Part No. 432610 (A2A5W17) (Sheet 1 of 2)

Figure 6-16. Cable Assembly, 352146, 7 Inch, Part No. 432610 [A2A5W17]
(Sheet 2 of 2)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV	ECN
P1	M078168 CONN COAX N MALE TO .141 CBL	1.00		930001	EA	16733			
P2	M078168 CONN COAX N MALE TO .141 CBL	1.00		930001	EA	16733			
1	M199161 CABLE COAX SEMI-RIG .141 OD TP 50 OHM5FT		VEN474906	UT-141A TP 5FT	FT	2K497	199161		
2	M199195 CABLE TIE 6.75LG BLACK	1.00		SSM2S-DO	EA	00779	199195		

*** E N D O F R E P O R T ***

NOTES (UNLESS OTHERWISE SPECIFIED

1. INTERPRET DRAWING PER DOD-STD-100.
2. IDENTIFICATION MARKING PER MIL-STD-130.
3. NOMENCLATURE TO BE PERMANENTLY STAMPED PER 622614 USING THE INFORMATION SUPPLIED ON SYSTEM CABLE DIAGRAM AND MARKER INSTALLED IN APPROXIMATE LOCATION SHOWN.
4. CONTINUITY TEST TO BE CONDUCTED ON FINISHED CABLE.
5. ASSEMBLE PER SCIENTIFIC ATLANTA STANDARDS 671009.

Figure 6-17. Cable Assembly, Coax, 421357, Part No.:
433205, 4.5 inch [A2A5W15];
433210, 7 inch [A2A5W18];
433212, 8 inch [A2A5W19];
433232, 18 inch [A2A5W16]
(Sheet 1 of 2)

Figure 6-17. Cable Assembly, Coax, 421357, Part No.: 433205, 4.5 Inch [A2A5W15]; 433210, 7 Inch [A2A5W18]; 433212, 8 Inch [A2A5W19]; 433232, 18 Inch [A2A5W16] (Sheet 2 of 2)

REF DESIG	PART NUMBER/ DESCRIPTION	QUANTITY PER ASSEMBLY	VENDOR	MANUFACTURERS PART NUMBER	U/M	CAGE CODE	APPLICABLE DOC NUMBER	REV ECN
P1	M076916	1.00			EA	16733		
	CONN COAX SMA MALE-NO PIN- TO .141 CABLE			515-001				
P2	M078168	1.00			EA	16733		
	CONN COAX N MALE TO .141 CBL			930001				
1	M199161		VEN474906		FT	2K497	199161	
	CABLE COAX SEMI-RIG .141 OD TP 50 OHM5FT			UT-141A TP 5FT				
2	M199195	1.00			EA	00779	199195	
	CABLE TIE 6.75LG BLACK			SSM2S-DO				

*** E N D O F R E P O R T ***

Scientific–Atlanta

MANUAL UPDATE

Title: S-Band TT&C Antenna and RF Subsystem

Publication No.: 55S381Z

Edition: First

Update No.: 1

Date: June 1992

Updates have occurred since the last printing of this manual. This update package consists of new and/or updated pages.

Updates are marked with the **Update No.** next to the Publication Number, and with a vertical bar in the margin next to the corresponding change. When the manual is revised, these bars are removed. If the entire page, figure or table is new, bars may be placed next to the page number, figure number, or table number only. If entire paragraphs are updated, a bar may appear by the paragraph title and number only (if applicable) and not the entire portion.

To update the manual, remove and insert pages as follows:

REMOVE	INSERT
Title Page	Title Page
5-3, 5-4	5-3, 5-4
5-5, 5-6	5-5, 5-6

After inserting all updated pages insert this instruction page immediately following the Title page of this manual.

S-Band
TT&C Antenna and RF Subsystem

Technical Manual

GENERAL ELECTRIC/0204

Publication No. 55S381Z

First Edition - November 1990
Update 1 - June 1992

Scientific
Atlanta

Table 5-2. Periodic Maintenance Chart - Continued

Requirement	Interval
Cleaning	
1. External Surfaces	S
2. External Controls/Receptacles	S
3. Internal Receptacles/Circuit Boards	S
4. Blower Screens	A/R

Legend: D-Daily; W-Weekly; B-Bimonthly; M-Monthly; Q-Quarterly; S-Semiannually; A-Annually; A/R-As Required

Table 5-3. Consumable Materials List

Nomenclature	Specification
Alcohol, Isopropyl	TT-1-735
Cheesecloth	CCC-C-440
Spray-type Contact Cleaner	None

5-4 PREVENTIVE MAINTENANCE.

The following procedures provide for routine inspection and preventive maintenance for the Antenna Assembly and RF Electronics Unit.

5-4.1 Routine Inspection. Routine inspection requires cleaning and inspection to prove serviceability. Routine inspection items are listed in Table 5-4.

WARNING

Dangerous voltages are present on exposed terminals. Remove power before performing any routine inspections. Care must be exercised to avoid contact with these dangerous voltages. Failure to comply with this warning can result in serious injury or death.

Table 5-4. Routine Inspection

Inspection Item	Procedure
Exterior Surfaces	Inspect for dust, dirt, lubricants, or other foreign matter, worn spots or deep scratches on surfaces, corrosion, marred protective finish exposing bare metal; missing, incorrect, illegible or obliterated markings, decals, or reference designators.
Connectors	Inspect for broken, loose, bent, corroded, or missing pins; cracked insulator inserts.
Fasteners	Inspect for broken, loose, bent, corroded or missing fasteners.
Hardware	Incorrect screw length; missing screws, nuts, bolts, rivets, lockwashers, and nutplates; screws, nuts, or bolts with stripped threads.
Operating Controls	Verify all operating controls function smoothly without binding, and do not move beyond internal stops. All switches and control knobs must be secured and properly aligned.
Wiring and Cable Assemblies	Inspect for cut, nicked, burned, or abraded assemblies, insulation exposing bare conductor; sharp bends which weaken conductor; points or abrasion not insulated; pinched or damaged wires; broken or loose lacing, tie wraps, loose clamps.

5-4.1.1 Pressurization System Inspection. Perform the following steps to inspect the pressurization system:

a. Purge pressurization system by pulling up gently on pressure relief valve on the rear of the S-band feed assembly. Hold valve open for 1 minute.

b. While purging pressurization system, visually check all components.

c. Time pressurization unit for duty cycle to determine if excess leakage has developed.

d. If leakage has developed, repair or replace pressurization system components or pressurization unit.

5-4.1.2 Feed Radome Inspection. Inspection of the feed radome requires use of a bucket truck. Perform the following steps to inspect the feed radome:

a. Inspect feed radome for indication of damage or aging.

b. If feed radome is damaged, temporarily protect feed from excess moisture by taping plastic over feed opening and turning off pressurization unit to feed.

c. Install new radome.

5-4.2 Cleaning. Clean exterior surfaces of the feed assembly as follows:

WARNING

Isopropyl alcohol is flammable. Use isopropyl alcohol only in well-ventilated areas away from energized electrical circuits, heated objects such as soldering irons, or open flames. Avoid excessive inhalation of vapors or prolonged and repeated contact with skin. Wear industrial rubber gloves and industrial safety goggles to avoid contact with skin. Do not take internally. Failure to comply with this warning can cause injury, physical disorder, or death.

CAUTION

Do not use cleaning fluids containing trichloroethylene, trichloroethane, acetone, or petroleum-based cleaners on equipment. Failure to comply with this caution could harm surfaces.

a. Brush dust from connectors with small paint brush.

b. Wipe surfaces dry with a clean, dry cheesecloth.

c. Clean exterior surfaces with a clean cheesecloth moistened with isopropyl alcohol or a general-purpose detergent. Use care to avoid entry of cleaning solution into interior of unit or into connectors.

d. Clean electrical contacts of connectors with approved spray-type contact cleaner.

5-5 OPERATIONAL CHECKOUT.

Operational checkout of the antenna and RF electronics consists of performing the OPERATIONAL CHECKOUT in the System Manual. The antenna subsystem must be tested in the system configuration.

5-6 TROUBLESHOOTING.

Most RF electronics failures result in loss of signal or ability to autotrack. When a problem develops with the S-band tracking channels, the problem can be determined by patching equipment into the affected circuits. Additional checks of tracking performance can be made with a boresight antenna.

Troubleshooting operations require a technician familiar with the system theory of operation and basic tracking antenna and microwave principles.

5-6.1 Troubleshooting Suggestions. Fault detection and isolation in some of the line replaceable units may be accomplished as follows:

5-6.1.1 MONOSCAN® Converter. Faults in the MONOSCAN® Converter are detected by loss of the tracking signal. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by observation of the input to the ACU using a spectrum analyzer.

5-6.1.2 Motorized Phase Shifter. Faults in the motorized phase shifter are detected by loss or degradation of the tracking signal. Isolation is accomplished by interpretation of indications at the ACU front panel and results of tests using the phase shifter control unit.

5-6.1.3 Low-Noise Amplifier. Faults in an LNA are detected by loss or degradation of the tracking or data signal. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by observation of LNA output with a spectrum analyzer.

5-6.1.4 Waveguide Switch Motor. Faults in a waveguide switch are detected by operational failure of the switch. Isolation is accomplished by interpretation of indications at the ACU front panel and verified by continuity check of the motor.

5-6.2 Troubleshooting Procedures. Troubleshooting procedures are described in Table 5-5. When an abnormal indication is obtained in use or in the operational check, this table will indicate the most likely causes and their solutions.

The Wilsonjones Difference

imagination Ring Binders

362-13B	Black
362-13BL	Dark Blue
362-13M	Grey
362-13W	White

Made in U.S.A.

MP MASTER
MA29896